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ABSTRACT

This document reports the results of a symposium held to examine: (1) the need for educational programs in energy conservation; (2) the issues and processes involved in the design, implementation, and evaluation of energy conservation educational programs; (3) the role of government in providing programs in energy conservation; and (4) the present cooperative efforts for meeting energy problems. Fourteen papers by participants are included, each preceeded by a brief abstract. Papers address evaluation, curriculum government role, attitudes, energy, and conservation as they apply to energy conservation education. (SL)

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ENERGY CONSERVATION EDUCATION

WASHINGTON, D.C.
OCT. 24-26, 1977

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INTRODUCTION

Public acceptance of a set of alternative measures to an existing system is dependent on how knowledgeable the public is about the attributes of these measures. Since energy conservation is in this set of measures for dealing with the shortage and the need for lead time for developing viable alternative sources of energy, an educational effort, directed toward all groups in the society - the consumers as well as the producers of goods and services, is urgently needed. A temporary conservation effort is dicated by the exigencies of circumstances, but permanent conservation ethics is an attitudinal problem and needs to be dealt with educationally.

Thus, the objectives of the symposium are:

(1) to examine the need for, and nature of educational programs in energy conservation;

(2) to examine the issues and processes involved in the design, implementation and evaluation of educational programs in energy conservation;

(3) to explore the role of government in providing for programs in energy conservation; and

(4) to examine the present cooperative efforts, if any, for meeting the energy problem.

These proceedings are presented in anticipation that their collection will generate new ideas regarding effective educational programs for energy conservation.

Note: The fact that the panel discussion could not be included in these proceedings due to technical difficulties is regretted very much by the editors. The contribution of Dr. Wilfred C. Burton, Manager of Educational Services, American Gas Association, Washington, D.C. in the panel discussion was particularly valuable.

ENERGY CONSERVATION EDUCATION IN U. S. SCHOOLS: NEED AND NATURE

Harold G. Shane

ABSTRACT

In 1976, the National Education Association sponsored a study which projected the nature of the world in 2001 - the twenty-first century. The panelists were not all educators, but they were asked to propose educational changes which their view of the future would require.

One of the points of major emphasis was the rapid exhaustion of cheap and convenient sources of energy, making conservation self-evident and mandatory.

Education for conservation must evolve a continuum which transcends the traditional concepts of "schooling" and becomes virtually life long. The scope - or nature of energy studies must persuade all content disciplines not be "tacked-on" as another curriculum extra. Similarly, the processes of learning - seeing relationships, inquiring, acting on data must be stressed, and appropriate content presented which objectively considers all viewpoint, seeks out all options, and works toward favorable compromise when opinions are, or seem to be irreconcilable.

Curriculum change is based on social change. The indicators that society is rapidly changing are obvious everywhere. Certain instructional procedures carefully planned offer a strong conservation study:

(1) introduction to key concepts of reality
(2) awareness of all alternatives,
(3) study of consequences,
(4) making of choices based on value system

ENERGY CONSERVATION EDUCATION
IN U. S. SCHOOLS:
NEED AND NATURE

by

Harold G. Shane

Introduction

Last year the National Education Association inventoried the ideas of a panel of competent persons in the U. S. and from overseas to ascertain their ideas as to the nature of the world which children and youth may inherit in 2001 A. D. The 50 panelists also were asked to suggest educational changes which the future appeared to mandate.

Among the dozen characteristics of tomorrow's world preserved in the NEA report,[1] none received greater emphasis than the point that the U. S. and other countries were rapidly exhausting the cheap and convenient sources of energy such as the oil and natural gas that have powered industry and transportation, warmed homes, and made possible the enormous farm crops of recent decades. Even more recently, the Congressional debates over the energy crisis have served to italicize the importance of a dynamic program in energy conservation education in the schools and other educational agencies.

This paper endeavors to examine (1) the need for energy conservation education, and (2) the role that schooling may play in the 1980's. It also (3) speculates regarding relevant curriculum change and (4) the issues that seem likely to accompany any significant modifications in instruction and content. Finally, (5) an effort is made to identify certain explicit curriculum changes which promise to develop in young learners the attitudes and the motivation to husband and to supplement hydrocarbon resources until other forms of energy can be developed on a large scale.

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[1] The 184-page report CURRICULUM CHANGE TOWARD THE 21ST CENTURY (1977), is available for $5.95 from the Publications Division, National Education Association, 1201 Sixteenth Street, N.W., Washington, D.C. Among the panelists: Lester R. Brown, Norman Cousins, Willis W. Harman, Patsy Takemoto Mink, Sir Walter Perry, David Rockefeller, Jonas Salk, Helvi Sipila, and Ralph W. Tyler.

The Need For Energy Conservation Education

There is little dispute about the need to conserve energy, but is there a need for energy conservation education? Patently the answer is an unqualified "yes"! But before presenting the case for it, let us define energy conservation education. The statement below would appear to be adequate.

Energy conservation education defined. It is that part of education that deals with the culturally derived problems related to humankind's massive past inroads on the more available, useful, and heretofore inexpensive sources of energy; their parsimonious use in present, and the development of alternative sources of power in the short-range future.

The definition is intended to imply that energy studies are a specialized component of environment education and that such studies merit, along with the most severe problems of pollution, top priority as a field of study.

A change model illustrating the need for energy conservation education. While the need for energy conservation education quickly becomes self evident to the thoughtful person who examines available data on resource depletion, the way in which evolutionary curriculum changes occur probably is less clearly recognized. The model on page 8 is intended to illustrate how pressure for energy studies has built up.

Box I in the model represents the conventional, accepted instructional practices of the present. These practices generally do not include much more than a few pious curricular genuflexions insofar as significant energy conservation study is concerned. Box III refers to the social indicators presaging present social changes with respect to public attitudes toward the energy crisis.[2] Among them are pressures for conservation, governmental policies mandating higher gas mileage from automobiles, increased discussion in public forums such as "Meet the Press," and so on.

Box II and Box III are interactive, as the two-headed arrow suggests. Social indicators not only foreshadow social change, they are in turn, modified by the success (or lack of success) they have in influencing social change.

Established social changes lead to criticisms and crises in education, Box IV. Among prominent symbols of a hierarchy of such crises in recent decades are:

1. The lofting of a satellite by Russia in 1957, an event which caused alarm about America's loss of ascendency in space technology...
2. The major increase in university level enrollment in the 60's--a phenomenon made even more controversial because of 14 years of unbroken academic test score decline...
3. The growing effort to provide for minorities, the disadvantaged, and the victims of racism...
4. Disarray on the campus due to years of dispute, alienation, and political assassination which crested in the death of four student protestors at Kent State University.

Many other items could be inventoried--the impact of television and change in family structures, for instance--but the four listed suffice to illus-

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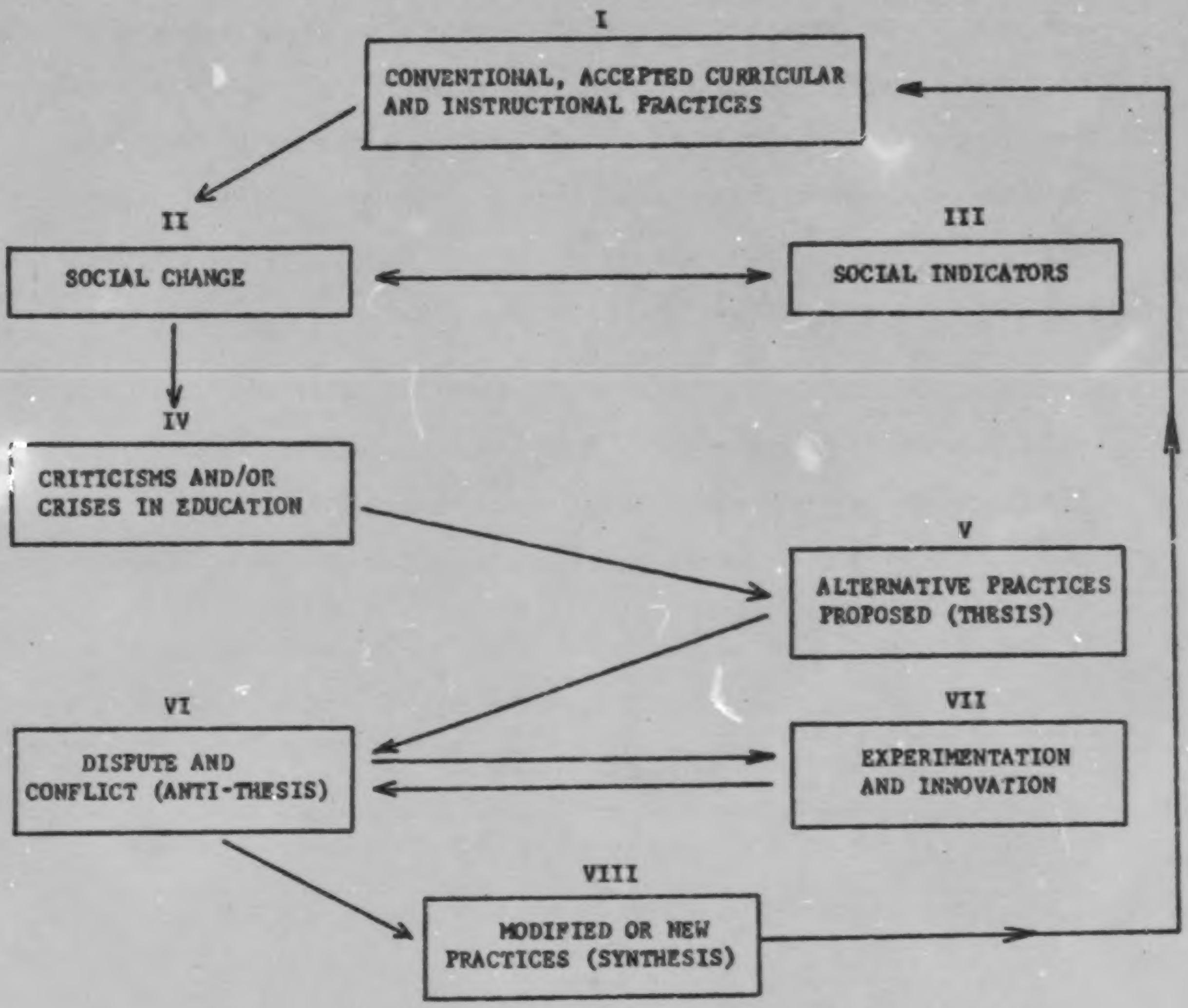
[2] It should be noted that the model pertains to all curriculum change, although it is interpreted here in the context of energy conservation education.

A MODEL ILLUSTRATING EVOLUTIONARY CURRICULUM CHANGE*


I
CONVENTIONAL, ACCEPTED CURRICULAR AND INSTRUCTIONAL PRACTICES
II
SOCIAL CHANGE
III
SOCIAL INDICATORS
IV
CRITICISMS AND/OR CRISES IN EDUCATION
V
ALTERNATIVE PRACTICES PROPOSED (THESIS)
VI
DISPUTE AND CONFLICT (ANTI-THESIS)
VII
EXPERIMENTATION AND INNOVATION
VIII
MODIFIED OR NEW PRACTICES (SYNTHESIS)

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*Designed by Harold G. Shane, Indiana University, Bloomington.

trate the point that social change inevitably has an impact on schooling. This brings us to Box V which represents the reaction of education to crisis through alternatives to past and present teaching methods and to substantive content which presumably have become obsolete. These are new "theses" regarding what constitutes good teaching, learning, and content.

As Box VI indicates, new ideas for educational change quickly are challanged and opposing opinion (the "anti-thesis") stridently is voiced. Box VII represents the educational experimentation and innovation (from "open education" to "back to the basics") that eventually leads to Box VIII--the "synthesis" of conflicting ideas in the form of modified or novel instructional or curricular practices. In time the "new" practices, if successful, become traditional--a development which carries us back to Box I where the cycle continually is in the process of repeating itself.

At present, insofar as energy conservation education is concerned, the public apparently is becoming aware of the crisis of crises[3] which include energy problems. There are numerous social indicators which substantiate this and there are signs of formidable social change as well. Criticisms of ecucation (Box IV) are surfacing as a result which, we may hope, will lead to growing number of innovations in energy conservation studies (Box VII) and their ultimate institutionalization (Box VIII).

In summary, the model has been intended not only to suggest that the times are ripening for energy conservation education, but that the processes of curricular change are moving from Stage IV to Stage V and shortly will reach Stage VI and VII.

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[3] Among them: pollution, population increases (and their evil twin, hunger), Third World demands for equity, troubled international waters, governmental debt and capital deficits, and the like.

Relationships Among Schooling, Education, and Energy

Schooling and education. It is helpful to separate schooling from education when contemplating energy conservation education. As Willis W. Harman recently said to the writer:

> The importance of education is crucial during the next 20 years, but the criticality of schooling is questionable because young people now in school will still be too young to participate in [e.g., energy conservation] decisions that must be reached before irreparable damage is done....[4]

This intriguing comment does not downgrade the importance of energy study in the U.S. schools, but it does emphasize the need to recognize that education is lifelong, that there are many learnings to be acquired after one has been graduated, and that the schools alone cannot be expected to provide extensive adult education without massively increased resources and the cooperation of the many information agencies with which public schools now share the monopoly they enjoyed in the 1920's and 1930's.

Lester R. Brown, the world food authority and President of WORLDWATCH, also pointed out to the writer that information pertaining to such matters as dwindling hydrocarbon resources "...was not obtained from their schooling but from the communications media."[5] In fine, persons concerned with energy conservation studies need to keep two points in the forefront of their minds. First, an effective program must reach Americans of all ages, and second, that such agencies as Public Service Broadcasting must be utilized more carefully, more methodically, and more extensively. This, of course, in no way suggests diminishing present efforts to create better learning involving the energy crisis for children and youth. Now, with this preamble, let us examine the nature of an energy conservation education curriculum.

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[4] Harold G. Shane, CURRICULUM CHANGE TOWARD THE 21ST CENTURY. Washington, D.C.: The NEA, 1977, pp. 142-3.

[5] Ibid., p. 135.

Some Speculations Regarding The Improvement Of An Energy Conservation Curriculum

Two precepts are widely respected by professional educators. One concerns the need to link the nature and scope of learning experiences to the developmental capacities of pupils. The other is the need to sequence what is learned so that it can be understood and acquired as efficiently as possible and also will motivate the young both to continue to study and to act intelligently in the light of what they have learned. These points suggest: (1) that energy conservation education should be based on an understanding of how children learn, and (2) how insight into energy problems can best be developed. Each of these matters will be considered in turn.

How Children Learn. Many detailed--and sometimes turgid--volumes have been written on the topic of human learning. The situation is further complicated by the fact that, in each generation for over a century, new research and theory have modified or discredited previous concepts. Mental discipline, connectionism, Gestaltist and field theory, holistic concepts, and neurobiochemical studies extending backward from Krech and Luria to the pioneering of Lashley and Coghill in the 20's have illuminated our understanding of learning, and at the same time humbled us by destroying our complacent acceptance of theory.[6] The comments which follow seek to avoid a hearty emphasis on theory, therefore, and concentrate on the classroom "know-how" gleaned from literally thousands of teachers with whom I have worked since the 1930's. Let us begin, therefore, with the question of how children learn.

For one thing, seasoned teachers know children and youth learn through example appreciably more than through precept. It is not so much what teachers say about energy conservation as what they do to serve as models. Turning off lights, avoiding waste in its many forms--and expecting children and youth do do likewise--is decidedly more effective than preachments about resource depletion. The younger the child the more powerful the impact of conservation, but it is important throughout life. When most of us reduce highway speed, object to empty office buildings gleaming needlessly at night, and the like the wastrel usually becomes self-conscious and responds to "mutual coercion" (Garrett Hardin's phrase) by cutting down on extravagant behavior.

Learners of all ages also are motivated by direct experience as well as by example. The total field of environment education, of which energy conservation is a major part, offers numerous examples of service learning and of action learning. As Toffler pointed out:

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[6] In 1966, while in Switzerland, I asked psychologist Jean Piaget, then in his middle 60's, how he would direct his career if he had forty years of research left to him. He smiled and said, "for one thing I would pay no attention to the psychologists. They will never agree on anything!" He then went on to say that he would invest his time in the chemistry of learning.

> ...the learner must have the opportunity to do more than receive and store data; she or he must have the opportunity to make change....This implies a basic modification of the relationship between educational theory and educational practice.[7]

Action learning, including worthy service in energy conservation activities is one of our educational challenges if energy studies are to have deep and lasting meaning. We need, with older learners, to offer recognition including course credit for work done outside school walls: political action for conservation, energy protection-pollution control endeavors, and related ventures. In energy education it is dangerous nonsense to think that children can be herded into artificial environments--nearly 60 million of them without participating, as their maturity allows, in guided learning-through-action; from classroom to field and field to classroom!

Also embedded in the process of significant learning in relation to energy conservation education is cross-disciplinary input--an approach to learning which brings together the social and natural sciences as well as the humanities. Of equal importance is the development of inquiry skills, the ability to learn how to learn. As the NEA Panel mentioned earlier agreed, new and fundamental processes need to permeate our schools and to attain there a coordinate relationship with basic skills:

1. Skill in human interaction--cross cultural and multiethnic insights
2. Contemporary skills including a knowledge of sources, the use of computers, ability to cope with specialization, but with a command of cross-disciplinary understandings
3. The ability to anticipate; to see relationships; to sort, weight, and to understand how power functions from neighborhood to international capitals.[8]

Children and youth also appear to learn more effectively when inquiry characterizes the methods employed in the classroom. In other words, young learners need to acquire the skills of finding and testing meanings actively rather than passively being exposed to content. As it was phrased by Henry Steele Commager, as I recall, the young learner is not a vassel to be filled with knowledge, but a lamp to be lighted!

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[7] Alvin Toffler (ed.), LEARNING FOR TOMORROW. New York: Random House, 1974, p. 13.

[8] Cf. CURRICULUM CHANGE TOWARD THE 21ST CENTURY, p. 45.

The learning continuum. Patently, the ways in which one learns, from early childhood to later maturity, vary along the way. As a consequence, both the scope and the sequence of what is learned must be varied along the way.

In early childhood and in the primary years, energy conservation education will of necessity be simple and informative rather than complex and inquiry-oriented. Work with five to seven or eight year olds, therefore, might help them to learn that people use energy in many ways: for heating, cooling, transporting, and communicating, for instance.

A recent 220-page publication from the National Science Teachers Association (NSTA)[9] provides an excellent instructional guide which illustrates the details of a K-12 program of the sort which the writer lacks space to describe. Suffice to say, the program provides experiences ranging from the simple (how we heat, light and move things) in the early years of school to the broad and complex ("No Gas Today. Tomorrow?") in the middle grades, and ("What are the Environmental Effects of Producing and Using Oil?") in the senior high school years. The NSTA experience-and-content guide with its helpful Mini-Units suggests explicit ideas which teachers can develop. They also are provided with the scientific information that some of them may lack in the first rate supplementary publications, the ENERGY-ENVIRONMENT MATERIALS GUIDE[10] and the ENERGY-ENVIRONMENT SOURCE BOOK.[11] The first of two contains superb, annotated lists of readings for both teachers and students. The source book is a remarkably readable and comprehensive compliation of information ranging from evidence of the energy crisis to a chapter, "The Exponential Century," which treats resource depletion.

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[9] Stephen M. Smith, (ed.), ENERGY-ENVIRONMENT MINI-UNIT GUIDE. Washington, D.C.: National Science Teachers Association, 1975. 220 + xv.

The value of the NSTA publications resides not merely in the data provided but in the way they suggest the concept of a continuum of curricular experience; a seamless sequence of important input.

At the post-secondary level it is impossible to present any sort of curriculum guide designed for mature (past 30) and senior (past 60) learners. Adults are "on their own". However, if they have acquired the knack of learning how to learn, numerous publications are available. For wide-ranging, shared energy conservation experiences, however, I see no more effective agencies than the mass media. Programs and publications for older learners probably can be more effectively publicized and coordinated by community agencies than has heretofore been the case.

Educational Issues Related to Energy Conservation Education

It is one thing to conjecture about energy studies in the abstract, quite another to come to grips with and to resolve the issues that inevitably surround it. Actually, these issues go far beyond energy debates. They are part of a much larger mosaic. Unless one sees and comprehends the total mosaic and allows for the problems the mosaic pictures, even well-designed energy conservation programs quickly can falter or at least lose any genuine impact.

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[10] Kathryn E. Mervine and Rebecca E. Crawley, ENERGY-ENVIRONMENT MATERIALS GUIDE. Washington, D.C.: The National Science Teachers Association, 1975. (Annotated Bibliography; approx. 100 pp.).

[11] John W. Fowler, ENERGY-ENVIRONMENT SOURCE BOOK. Washington, D.C.: National Science Teachers Association, 1975. (Two volumes, bond together, totalling 279 pp.).

The anatomy of energy study issues. In simplistic terms, the greatest roadblock to successful energy conservation studies consists of the problem-question, "Whose brand of energy conservation education shall we share with learners?"

In my opinion, and there is reason for it to be a humble one, the problem resides in the fact that no matter what content is taught, no matter what approach is taken to education and to its important sub-component, schooling, the content and the procedures employed will pose a threat to someone. And it is the threat-factor that creates issues in virtually all fields of human endeavor and human interaction.

The problem is illuminated by the continuing conflict in Congress over the President's energy program, but the roots of the debate extend backward through time to the disagreements that have divided U. S. legislators (and citizens they are elected to represent!) from the earliest days of our history as a republic.

Issues, and the controversy they breed, are rooted in the fact that at a given time 50% of a representative population is below the median socially, economically, and in various other ways. As suggested by the two models below, a constant pressure exists and a continuous tension is created as the "have-nots" below the median seek to create a situation in which they become "haves." Since by statistical definition only 50% can be above the median, the "haves" feel threatened by a diminution of income, social status, and prestige in a material culture when any policy seems likely to lead to the shift depicted in Figure 3.

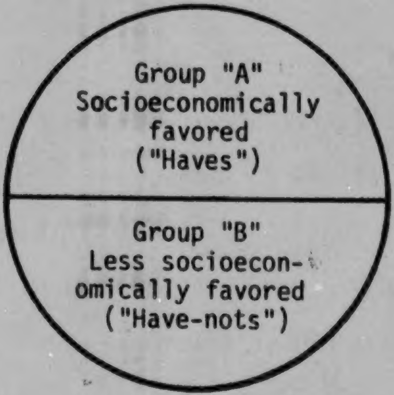
Group "A"
Socioeconomically favored ("Haves")
Group "B"
Less socioeconomically favored ("Have-nots")
Median

Figure 2

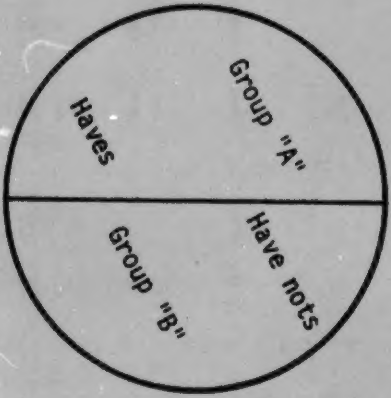
Haves
Group "A"
Group "B"
Have nots

Figure 3

Essentially then, a basic issue--perhaps THE basic issue--in energy conservation education is to create a program and policies that promise to lead to actions that serve the material and positional interests of both the more advantaged and the less advantaged. Thus far, no viable answer has been formed as to how one can cope with the drive on the part of Americans to achieve "equality" with the top 10%! Such factors as political commitments, special interest groups, and the intricate web of foreign policy in the realm of natural resources add further complications.

The diesel dilemma. Social decisions affecting future energy conservation policies (and education) are badly needed but painfully difficult to reach. Basically, we probably have three choices insofar as technological developments are concerned:

1. We can continue traditional exploitive, environmentally harmful policies...
2. We can move toward more sophisticated technologies (e.g., low energy consumption machines)...
3. We can begin to emphasize devolutionary technological strategies in the hope that humans eventually can reach a state of "dynamic equilibrium" (Dennis Gabor's term) in which we and the environment are in balance.

Choosing among the three options above is not easy as the diesel dilemma illustrates. At present General Motors, Peugeot, Volkswagon, and Mercedes Benz are among the transportation merchants marketing diesel-powered passenger cars. Some are rated at over 50 mpg, all are relatively parsimonious in fuel consumption, and all use a No. 2 fuel oil that requires less petroleum than gasoline to produce a given quantity of fuel. At first glance one might assume that the government should deploy policies and monies that encourage dieselization while we quest for, say, a practical electrically powered auto.

But it isn't all that simple! If the diesel auto should, in a few years, become commonplace and if many diesels travelled 100 miles on 20 gallons of fuel oil rather than 300 miles on 20 gallons of gasoline, the immediate result could be exceedingly stressful for major oil distributors' profits--and to the widowed, the elderly, the associations, the unions, and so on, who are at least partly dependent on investment income!*

Other examples readily suggest themselves--and all have a direct or indirect bearing on the "Who-will-be-advantaged-or-disadvantaged?" problem modeled in Figures 2 and 3. Let me repeat for emphasis that energy conservation education is made ineffably complicated by confirming interests and the diverse (and sometimes polar!) goals which they and various individuals and groups to seek.[12]

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*Another important complication resides in the fact that gasoline also is produced when crude oil is refined. Too many diesels could create a gasoline surplus!

Without in any way intending to imply that effective energy conservation studies are not feasible in our schools or important for the mass media to emphasize, I would be less than honest if I did not state that *certain social decisions are needed to facilitate instructional programs that move beyond merely informing the learner*.

Among these decisions are: determining how we shall improve our naive use of technology in the use of energy, deciding how much (if anything) the advantaged American is willing to relinquish in the interest of greater equity in the exploitation of resources including the nature of the "good life," achieving a value consensus with respect to energy, and maximizing the value of television (without censorship) so that this medium is a more effective educational tool as well as a source of entertainment.

Transitional Curriculum Change

Granted that controversy surrounds energy conservation, certain changes can be made to introduce or to strengthen education for energy conservation. Some instructional proposals which seem feasible ones to implement during.

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[12] For a statement on the problem of conflicting views and political considerations, cf. Lewis H. Lapham, "The Energy Debacle," HARPER'S 255:58-74 August, 1977. Its focus is on the Ford Energy Project published in October, 1974, with the title, A TIME TO CHOOSE.

the next five to ten years are now explored. These suggestions build on my earlier comments (pages 11-13) on how learning can be expedited, on learning skills (page 13), and on the idea of seamless learning continuum extending throughout life (pages 14-15).

Five key concepts in energy conservation studies. In view of the confusion and conflicting data on the topic, education should concern itself with the key concept of realities to which young learners and, indeed, learners of all ages should be introduced. This includes the realities of unwise consumption, resource depletion, and those political dimensions involving the special interests of the advantaged and disadvantaged.

A second concept that needs to infuse energy conservation education is that of alternatives. In view of realities (insofar as we have the ability to pin them down), what are the options open to humankind as it faces the energy crisis related problems that loom ahead? Then what are the consequences of selecting a given alternative? Cost, human factors, safety, efficiency, environmental impact, and availability are representative of the elements involved.

Next we come to choices. What selections do we make from among the options? To what do our values--once they are clarified--point? Finally, there is the fifth concept to be communicated through education: how can implementation be carried out? How do people work together on cooperative projects, what procedures work best, and what use must be made of the content of various relevant disciplines?

The five concepts and curriculum change. The concepts or premises listed above should in no way be confused with a curriculum for energy conservation education. A curriculum is made up of materials and ideas; it is a guide to what may be taught--often a document like the NSTA's ENERGY-ENVIRONMENT MINI-UNIT GUIDE.[13] Rather, the five premises suggest strategies to be used during a transitional period of perhaps a decade while humans seek to cope with environmental problems.

Furthermore, the applications of such terms as "realities" and "alternatives" will vary substantially from one age group to another. But even the very young can begin to understand realities and they have begun long before their first day in school to sense that there are alternatives and that each one has certain consequences when choices are made and implemented!

Concluding Comment

It seems clear to the writer that the need for a lifelong continuum of energy conservation education is so evident as to need no lengthy justification. Furthermore, the sequencing of appropriate content for an early childhood-to-secondary education continuum poses no great problem. The NSTA MINI-UNIT GUIDE is full of good ideas--classroom "leads" to suitable experiences--which can readily be adapted to varied age groups with diverse, multiethic backgrounds.

One begins to encounter problems in the school when the scope of (the nature of and data bases for) energy studies is to be decided. The problem here is two-fold: (1) the schools have entrenched content and long-established traditions which compete for the time that is available for instruction,[14] and

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[13] Cf. footnote #9.

[14] E.g., time used for conservation studies in grade five must come from other fields of study: spelling, mathematics, reading, or social studies.

(2) there are many conflicting viewpoints with which the school must cope. The opinions voiced and the data cited by the administration and by oil company spokesmen often fail to coincide and their conclusion sometimes can only be described as bi-polar!

The contemporary endemic confusion seems to require energy conservation studies (appropriate to the learners' diverse age spans) which focus on the development of "new basics" in addition to the three R's; skills which include learning to learn, to anticipate, to see relationships, to inquire, and to act on data.

As mature adults, teachers and all other citizens have a responsibility to work toward consensus--toward a community of uncoerced conviction--and to reach honorable compromises when opinions temporarily are irreconcilable with respect to such social decisions as will govern our use of technology in the years ahead.

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Over the years Dr. Shane has been author or co-author of over 400 publications. In 1974 he won an EdPress Award for outstanding contributions to educational journalism. During 1972-73 he planned and prepared the USOE Report on the future of education, later published by Phi Delta Kappa as THE EDUCATIONAL SIGNIFICANCE OF THE FUTURE. As a consultant to the Danforth Foundation he directed three national seminars on the future, and in 1976 prepared a special Bicentennial Report for the NEA: "The Seven Cardinal Principles Revisted." In 1977 the NEA published his latest volume, CURRICULUM CHANGE TOWARD THE 21ST CENTURY.

PRINCIPLES GUIDING THE DESIGN OF AN ENERGY CONSERVATION EDUCATION PROGRAM

Truman D. Whitfield

ABSTRACT

As a result of experiences in the Home Energy Conservation Project at the University of Houston, which resulted in a workshop program designed for builders and financers of new homes, the Education Component of the project has developed some principles which are applicable to the design of other energy conservation education programs. Further, because of the complete nature of energy conservation programs, the principles may be applied to any educational program which is interdisciplinary.

Energy conservation education programs, to be viable, should be considered inherently interdisciplinary and involve sciences, economics, marketing, and architecture as well as education. Energy programs need a basic and well understood goal - orientation. The entire work of a program should proceed from a clear curriculum model. The organizational structure must be one understood by all involved. Continuous evaluation is mandatory.

Finally, the issues of difference and support are crucial to the success of interdisciplinary endeavors. People are different, vocabularies are different. Working styles are different. Through full institutional support, however, interdisciplinary efforts, by addressing issues before they become problems have a good chance of success

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by

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The "energy crisis" has had an extreme impact on the economic, social, and political structures of the world. The magnitude of this crisis demands that we search for immediate and long range solutions to energy problems. Two possible routes to the solution of the energy problem have been consistently proposed: (1) the development of alternative sources of energy; and (2) the efficient utilization of energy.

Extensive research is underway in both these areas. The exploration of atomic energy, geothermal energy, and new ways of using coal and other organic materials are some of the alternatives being studied. Energy industries are continually providing the consumer with information on energy conservation through television commercials, brochures, and billboard advertisements. While these activities have had some impact, still other more intensive efforts are needed. The long range solution to the energy problem will require strong energy conservation education programs.

The design of energy conservation education programs is by definition an interdisciplinary undertaking. Viable energy conservation education programs should involve people and ideas from the sciences, economics, marketing, architecture and education to mention a few.

When individuals from different academic backgrounds attempt to work together on an interdisciplinary curriculum development effort problems often arise. Many problems can be avoided if persons involved in curriculum development activities are aware of the kinds of problems that frequently arise and are equipped with some possible solutions to those problems. Some problems and possible solutions can be addressed by examining six principles related to interdisciplinary curriculum development efforts. Each of these principles will be examined below in terms of their meaning for future program developers. Throughout the discussion of each principle I will relate how the principle was manifest in the Home Energy Conservation Project and how we dealt with issues related to each principle. The six principles are:

1. Interdisciplinary curriculum development projects must be goal oriented.
2. An interdisciplinary curriculum development project must have a clear curriculum model.
3. An interdisciplinary curriculum development effort must have an organizational structure that is clearly understood by all persons involved.
4. An interdisciplinary curriculum model must provide for continuous evaluation.
5. People involved in an interdisciplinary curriculum development effort are different.
6. The institutional setting must be supportative of interdisciplinary efforts.

1. Interdisciplinary Curriculum Development Program Must Be Goal Oriented

All persons involved in interdisciplinary curriculum development efforts must recognize and identify with the goal that serves as the major focal point of those efforts. People working in interdisciplinary efforts must realize that the goal has value and, as such, is worth their personal efforts. If the goal is valued by persons involved in the curriculum development process, they are more likely to move outside personal agenda and be more accepting of suggestions offered by persons from other academic desciplines. While personal agenda are extremely important people working in interdisciplinary projects must realize that they may have to relinquish some personal goals in order for the overriding project goal to be realized.

The goal orientation of an interdisciplinary curriculum project can reside in the strong personal leadership style of one of the members of the curriculum development team. Such is often the case with federally funded curriculum development projects. In instances where a single individual has strong leadership qualities and has a goal toward which he is striving the person is able to spread his enthusiasm to other members of the development team. When this occurs the team members often associate with the leader's enthusiasm regardless of the cognitive orientation of his personal goal.

From its conception to the present time the Home Energy Conservation Project has a very clear goal. That goal, as implied by the project title, was to create an instructional program that could have some impact on energy conservation in the home. There were three academic disciplines involved in the project; Architecture, Education, and Marketing. Every member of the project staff knew the goal from the beginning of the project. We were all comfortable with the goal. Regardless of the arguments and disagreements throughout the project, and there were some, we still kept returning to that goal. Continually project staff members relinquished personal agenda which did not seem to help toward realizing the goal of the project.

2. An Interdisciplinary Curriculum Development Project Must Have A Clear Curriculum Model

Two kinds of curriculum models are necessary for effective functioning of interdisciplinary curriculum development efforts: The two types of curriculum process models are, (1) a conceptual model, and, (2) a curriculum process model. Conceptual models provide a framework within which the activities of a curriculum development effort function. A conceptual model sets the parameters for such efforts. Conceptual models serve to indicate relationships among variables to be addressed in the development task.

The conceptual model for our project focused on the relationship between KNOWLEDGE, ATTITUDES, and BEHAVIOR. A major assumption of our conceptual model is that one doesn't significantly alter behavior without having an attitude that is supportive of a behavior change; and, that attitudes are contingent upon the knowledge one possesses concerning a given entity. In terms of our conceptual model we felt that if we were to have a significant impact upon the energy conserving behavior of people in the home energy project we had to begin by providing some background knowledge.

The knowledge dimension of our model was two fold. We believe that before people in the home building industry would move to investigate seriously the energy conserving techniques they would have to be convinced that the public was ready for such changes. With this in mind we conducted an extensive survey to determine the knowledge, attitudes and behavioral characteristics of conservers with respect to home energy conservation. In addition we presented the same survey to people in the home building industry. The data that resulted from these surveys put home builders in a conflict situation. Perhaps for the first time they were made to realize the discrepancy between what they believed the consumer knew, believed, and did, and what the consumer actually knew, believed, and did. This data then resulted in people from the home building industry seeking new knowledge perspectives on home energy conservation.

The second issue of the knowledge dimension concerned the technical nature of the content we presented to the Home builders. We realized that content associated with home energy conservation could be highly technical. We believed, however, that we would be more successful in the project if we avoided presenting highly technical information. Instead, our efforts were directed at the synthesis and application of knowledge gained through our program. We gave some technical information, though not too highly technical, and followed the cognitive imput immediately with synthesis and application type activities. These often took the form of work-study sheets, or simulations. Our intent was to emphasize the importance of applying the knowledge people already possess and not to burden people down with expensive information that would have little utility.

In addition to a conceptual model, curriculum development projects must have a clear curriculum process model. Such a model is especially necessary in interdisciplinary curriculum development projects involving people from different disciplines.

A primary function of a curriculum processes involved in the curriculum building events throughout the project. If the process model is to be effective, the elements contained in it must be specific enough to provide guidance, but not so specific that it creates unnecessary tasks to be completed during the project. The model must allow for some divergence yet keep people moving in a direction that will assist them in achieving the primary goals of the project.

The curriculum process model* designed for this project serves two very important functions. First, the model specifies major curriculum development process systems and subsystems inherent in the project, and the relationships between and among the various systems of the model. Second, the model is somewhat linear providing some guidance in the developmental activities of the project.

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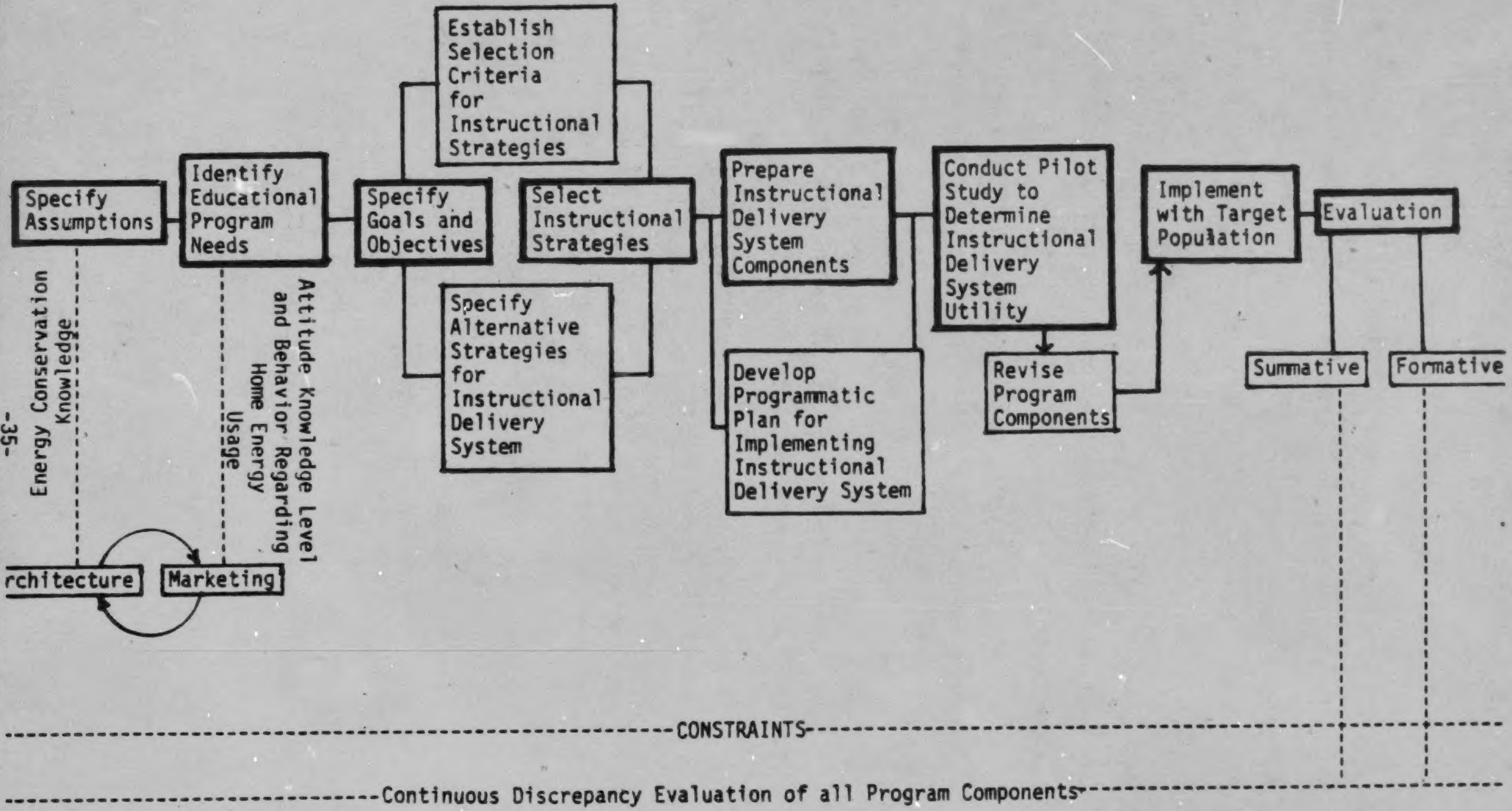
*The model designed for this project utilizes a basic structure discussed by Glenys Unrich in her book, Responsive Curriculum Development: Theory and Action. McCutchan Publishing Company. Berkeley, 1975. A number of modifications have been made in Unrich's model to meet the needs of our project.

While the model is laid out in a linear fashion, the intent is that the model be only partially linear. There are a number of components of the model functioning simultaneously, even though they are represented as linear. The use of continuous feedback also precludes the absolute linearity of the model.

The curriculum process model for this project is systemic in nature. As such, the model should be viewed as having a set of major systems with some subsystems functioning as inputs to the major system. The major systems of the model are all one horizontal plane and outlined in heavy type. (See the model on the following page.) All sub-systems are represented on other horizontal planes.

Specify Assumptions. At the onset, and through the evolution, of a curriculum development project certain assumptions are made. These assumptions, if not dealt with consciously, can impede activities associated with the curriculum development processes. Therefore, at the onset of this project, assumptions governing the operation of the project are made public for all those involved in the project. Arriving at these assumptions requires input from all project staff in order to insure clarity of initial operational bases.

Educational Needs Relevant to the Project. The identification of needs to be met is perhaps the most critical function of any curriculum develop-


Specify Assumptions
Identify Educational Program Needs
Specify Goals and Objectives
Establish Selection Criteria for Instructional Strategies
Specify Alternative Strategies for Instructional Delivery System
Select Instructional Strategies
Prepare Instructional Delivery System Components
Develop Programmatic Plan for Implementing Instructional Delivery System
Conduct Pilot Study to Determine Instructional Delivery System Utility
Revise Program Components
Implement with Target Population
Evaluation
Summative
Formative
Energy Conservation Knowledge
Attitude Knowledge Level and Behavior Regarding Home Energy Usage
rchitecture
Marketing
CONSTRAINTS
Continuous Discrepancy Evaluation of all Program Components

ment project. It is upon such needs that the total program is based. The educational needs inherent in this are identified by two main processes: (1) a review of literature and (2) the data resulting from a survey of the target group undertaken by the marketing component. The needs which this project will attempt to meet are stated in terms of knowledge, attitudes, and performance, relative to energy conservation in single family homes. The educational needs flow from needs identified by project staff in Architecture and Marketing.

> Architectural Needs. The knowledge, attitude, and performance needs growing out of architecture are specific to the discipline of architecture. As such, the content identified by architecture comes primarily from literature on energy consuming design techniques. Some of the knowledge gaps among the target population related to energy conserving architecture were identified through data resulting from the marketing survey.
>
> Marketing Needs. The marketing component of the project is primarily concerned with the issue of the marketability of various energy conserving design features alluded to in the project as also the present attitudinal disposition of the target population toward energy utilization and conservation. As such, most of the marketing information needs were generated through a survey conducted by this component. The data generated by this survey served a vital function in total project operation, and particularly so in the design and use of the curricular materials generateed through the project.

Given these two needs sub-systems, the information flow into the educational needs system is along two different lines. One line of information flow is concerned with general energy conservation knowledge. This information comes from the architectural component relative to energy conservation systems. The knowledge represented herein is general and has generalizability into many different areas.

The second line of information represents specific attitude, knowledge, and behaviroal information resulting from the marketing survey. The information generated through the survey employed in this project has a more limited generalizability. Collectively, these two thrusts provided the educational needs base for the project.

Specify Goals and Objectives. Inherent in this system is the generation of broad general goals of the project first, with the statement of more specific objectives coming with the various curriculum pieces. These goal: provide the bases from which instructional activities are designed. The objectives also provide a backdrop for future evaluation.

Once the goals and objectives have been identified and stated, two parallel sub-systems were addressed before the next major system of the model could be realized.

Establish Selection Criteria for Instructional Strategies. Given the goals and objectives, based upon needs identified by the architecture, marketing, and education components, a list of criteria were generated which served as limits to the kinds of insturctional activities appropriate for the project. These criteria should reflect human and material resource constraints. When such criteria are generated prior to the design of various instructional activities, fewer problems result in the development of those activities.

Specify Alternative Strategies for Instructional Delivery System. This component of the model requires that several alternative instructional strategies be identified as possible avenues to be explored in the instructional delivery system. These strategies should be based on instructional literature as valid and reliable approaches to the delivery of various types of content.

Select Instructional Strategies. Using the criteria generated in the previous sub-system. A list of alternative instructional strategies for the project.

Prepare Instructional Delivery System Components. Once the appropriate strategies have been identified for given objectives, the next step involves the preparation of the curricular materials for the instructional delivery system. To insure adequate preparation of materials total staff involvement is essential.

Develop Programmatic Plan for Implementing Instructional Delivery System. Having completed all of the instructional delivery system components, the next task identified in the process model is the development of a programmatic plan for implementing the instructional delivery system. In reality, the conceptualization of this plan is an evolutionary process beginning even with the assumption stage and continuing to evolve throughout each segment of the project model, and finally culminating in this phase of the model. The plan evolving employs all the input information to date in the project resulting in a set of procedures to be followed by project in using the instructional materials with the target population. The curriculum organization pattern for the project curricular components is most critical in this stage.

Conduct Pilot Study to Determine Instructional Delivery System Utility. After developing the instructional delivery system components, and putting those components together into some programmatic plan, the next step indicated by the process model is the field testing of the instructional delivery system. The purpose of this pilot study is to obtain data relevant to the use ability of various instructional delivery system components as well as the utility of the programmatic plan. The formative data generated by this state may result in modifications going all the way back to the assumptions stage, or, to any previous point in the model. However, it is highly unlikely that any major revisions would result from the pilot.

Revised Program Components. Depending upon the data generated in the pilot study, modifications in program components should be made in order to improve the utility of the instructional delivery system. As discussed in the preceeding section, it is highly unlikely that major revisions will be needed in the instructional delivery system. However, one should expect some slight modification.

Implement with Target Population. Having once conducted a pilot test of the program and made any necessary changes in program components to insure utility of the components, the instructional delivery system is ready for use with a representative sample of the target population. This phase is the culminating point for the many development activities which preceeded it in the project model. The purpose of this stage of the model is to test for the degree to which the project achieved its primary goal.

Evaluation. The evaluation stage of the model has two basic components, summative and formative evaluation. Both the formative and summative evaluation components extend to a base line called "continuous discrepancy evaluation of all components." This serves to illustrate that discrepancy model will be employed throughout the project.

Summative Evaluation. This type of evaluation represents an attempt to gather information relative to the degree to which project components were able to bring about desired results as specified in the porject proposal. Summative evaluation often takes the form of an experimental design posited to test realtionships between variables under study in the project. The results of this evaluation will provide information relative to the possibility of using the system with other populations to achieve similar ends.

Formative Evaluation. We have placed formative evaluation last in the model to illustrate our contention that every phase of the model (project) should constantly and continuously formatively evaluate. Such continuous evaluation is needed to provide feedback into all phases of the project so that the most viable instructional program can be developed given the limits of the project.

Constraints. Continuing across all aspects of the model is a section called constraints. This is done to illustrate that the project staff in continually alerted to any, and hopefully all, constraints which have the potential to interfere with the successful operation of the project.

3. *An Interdisciplinary Curriculum Development Effort Must Have An Organizational Structure That is Understood By All Persons Involved*

At the beginning of project operations, or before if possible, the organizational structure of the project needs to be addressed. This will involve a serious planning effort by the people who are to work on the project. It is imperative that all project staff be involved in this palnning effort for its outcome will govern to a great extent the interactions that take place throughout the project. During this planning session all project staff should feel free to provide input into the determination of an operational structure without their inputs being judged harshly by others.

There are some important elements inherent in an organizational structure. First, the organizational structure must provide for open channels of communication. Organizationally, some efforts must be made to provide a forum for an exchange of ideas from among persons involved in the interdisciplinary curriculum development project. The organizational structure should provide a blending of both formal and informal communication meetings of staff personnel.

A second element needed in an organizational structure is a clear delineation of the decision - making structure inherent in the curriculum development project. This part of the organizational structure should specify whether decisions are to be reached in a cooperative, horizontal fashion or if the decision - making structure is vertical. Regardless of the attack taken on decision - making, the procedures for reaching final decisions must be public, and above all must not contain hidden agenda. When hidden agenda surface in the decision - making structure the results are often devistating to future project operations.

A third element needed in the organizational structure is some kind of time line for meeting set goals and/or tasks of the project. This time line serves to clearly indicate to different project staff the tasks to be accomplished, their starting dates, and their appropriate completion dates. Task charts such as Gant charts are frequently used in curriculum development projects.

Closely related to the task chart is a fourth portion of the organizational structure that specifies resource availability and utilization. Both human and material resources must be included in this section of the organizational structure. In determining the availability and utilization of human resources it is imperative to first determine the role responsibilities of each person in the curriculum development effort. Each person must be informed of his respective role responsibility and to whom he is accountable for meeting his responsibilities. Once guidelines specifying role responsibilities and accountabilities are determined all project staff must abide by those guildelines.

Having established guidelines concerning role responsibilities and accountability of people involved in the curriculum development project it is then necessary to specify guidelines governing the allocation and use of physical resources. All available resources must be identified and procedures for using these resources stated. When resources are in high demand, decisions need to be made concerning who should use what resource, when.

While the elements of an organizational structure discussed above do not constitute all such functions, they are some of the most important organizational concerns. We were careful to address each of these considerations in our project. Our major weakness in terms of the organizational structure was that we waited until the project was already in operation before addressing this vital issue. As such, the operation of the first weeks of the project was somewhat confusing. When we did address the organizational problem we established a clear and open channel of communication. We involved all project staff in addressing the organizational issue. Out of these efforts came a statement of responsibilities for each staff member, an identification of the resources available to us, and a task chart that served to guide us throughout the project. We also determined that we needed both formal and informal meetings with goals and agenda for the more formal meetings. We determined a structure for making decisions. Once we had determined such an organizational sturcture the project seemed to function much more effectively.

4. An Interdisciplinary Curriculum Development Model Must Provide For Continuous Evaluation

In order for an interdisciplinary curriculum development project to function effectively some process of continuous evaluation and feedback is essential. Formative evaluation procedures serve to provide guidance to project staff as they move through various phases of a development effort. When formative evaluation procedures are utilized data are collected on every aspect of the project.

The formative evaluation model utilized by our project staff was a compilation of two existing evaluation models: a discrepancy evaluation model developed by Daniel Stuffelbeam. More specifically, our model was involved a slight modification of an evaluation model designed by Edward Ambry (1972) for evaluating environmental education programs.

There are four major phases of the program evaluation model utilized in our project:

A. Planning - concerned primarily with the conceptualization and design of the total project.

B. Operations - those measures taken to provide an environment such that the conceptual model proposed can be implemented with the least amount of trouble.

C. Development - deals with the actual production of artifacts called for in the goals of the project.

D. Implementation - program components are actually put into operation.

The CIPP dimension of the evaluation model provides a vehicle for assesing the specific elements associated with each major phase of the model. The CIPP model has four dimensions:

> C - Context: This dimension represents very specific needs associated with any standard of any phase. They (the context needs) are related almost entirely to that standard, but not necessarily exclusive of other standards.
>
> I - Inputs: What are those project inputs necessary for meeting the needs of that specific standard? The needs are those specific standard.
>
> P - Processes: How program inputs, functions, or processes occur in satisfying the context needs for that specific standard.
>
> P - Products: What are the specific outcomes achieved in working toward satisfaction of a given standard?

As one attempts to use the model to collect data relevant to project, it should become evident that although the evaluation model has the appearance of being linear, indeed it is not. One cannot simply go through each stage of the model treating that stage independently of the other stages. The evaluator, in applying the evaluation model, must analyze several standards of parent stages simultaneously. In addition, many of the standards and/of stages must be evaluated many times throughout the duration of the project.

Given the above statements and basic premises upon which the evaluation model has been devised, a discussion of the processes for utilizing the model, there are four phases inherent in the model: Planning, Organization, Development and Implementation.

Associated with each stage are four evaluation process components for assessing the functioning of each stage of the model. The process components are: (1) standards, (2) performance, (3) comparison, and (4) discrepancy information.

The standards component of the evaluation process refers to those global statements indicating criteria of acceptance of various program entities. The standards are written in the form of qualitative statements specifying some set of ideals for various program elements. There might be as many as ten standards stated for any one stage of the project.

Since standards are such broad statements, the successful evaluation of each standard must be achieved indirectly rather than directly. That is, while one is given a standard statement, there are a number of "sub-statements" which would provide a more reliable indicator for judging whether, in fact, a given standard had been achieved. In this model, the "sub-statements" appear in the form of specific questions to be asked relative to a given standard. The "sub-statements" come under the heading of: C - Context, I - Input, P - Process, and P - Product. (See above for a more detailed explanation of CIPP.) It is the evaluator's responsibility to seek answers to these questions to attest to the degree to which the project is functioning successfully. To score a given statement, the evaluator either checks the appropriate response, provides a narrative discussion relative to a given issue, or responds utilizing a scaling response where requested. The scale is: (1) Very Adequate, (2) Adequate, (3) Partially Adequate, and (4) Inadequate.

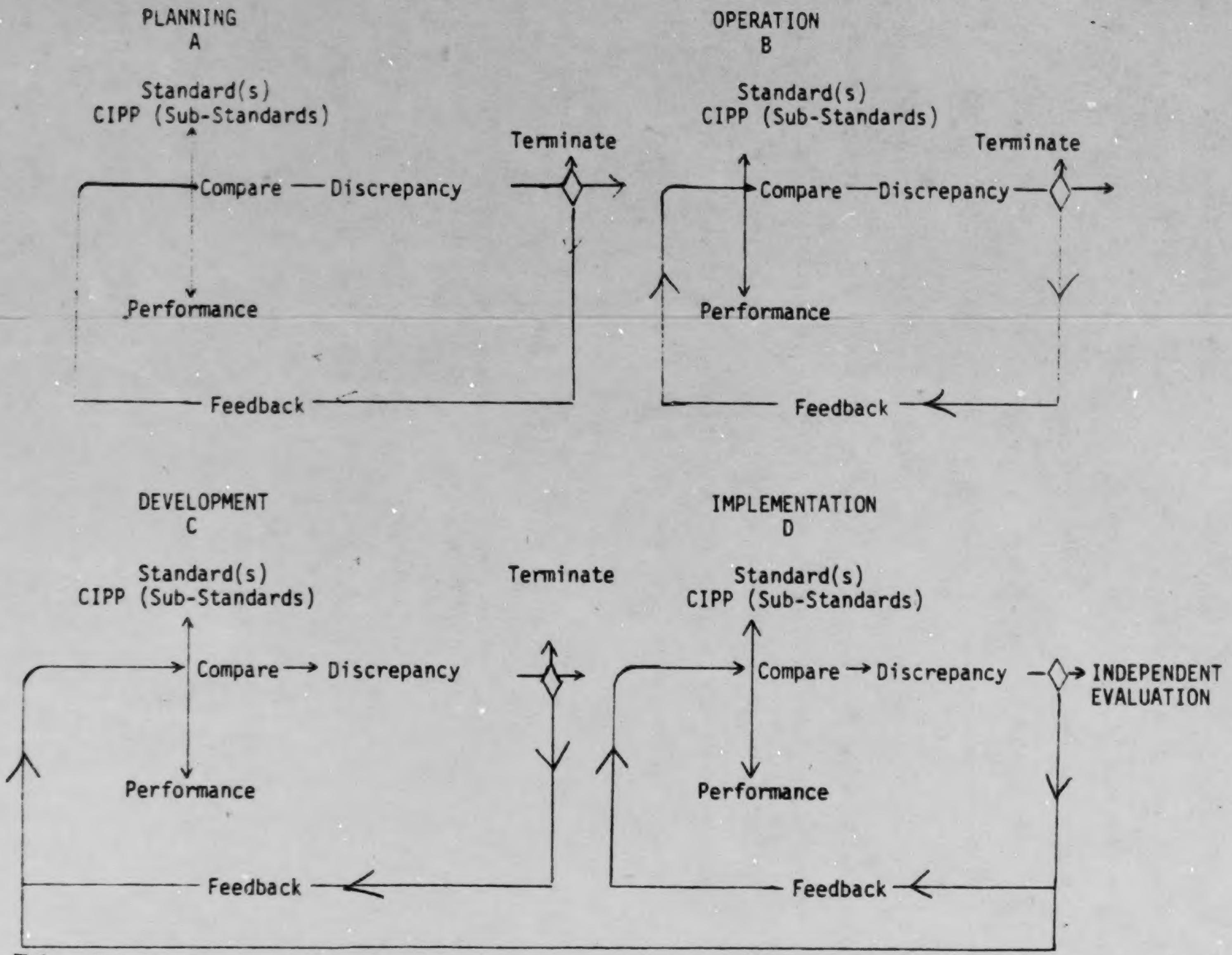
In seeking answers to the questions raised as "sub-standards," the evaluator moves into the second of the processes inherent in the evaluation model - Performance. The answers to these questions grow out of, and are reflective of, the actual performance of the project. The project performance is assessed within the parameters of the evaluation model. The assessment of the projcet performance is the primary objective of the evaluation model.

The third process identified in the evaluation model is Comparison. This process involves a careful analysis of all data obtained through the application of the evaluation questions. The comparison results when the project performance data is compared with the desired performance as specified in the standard statement or "sub-standard" question.

Once all the data are in and the analysis conducted in the comparison process stage have been completed, the final process is the Discrepancy Information process. This process is analogous to the discussion and conclusion stages of a research report. The discrepancy information process requires the evaluator, working with project staff to review all of the data relative to each standard of each stage and make a decision as to whether a given standard or stage has been adquately completed. If the standard or stage is judged to have been completed, then attention is focused on the next standard or stage. If the standard or stage is judged inadequate, then formative information is fed back into those project activities relevant to the standard or stage under consideration in order to enhance its chances of being judged adequate in future evaluation activities. The evaluation model is presented on the following page.

If the formative evaluation model is to provide the kinds of information desired relative to project operation, there should be someone assigned to the project who is to be responsible for internal evaluation. In most funded projects there is also an external evaluation for the project. Both the internal and external evaluator should have specific responsibilities.

The evaluation model developed for our project was used by both the project personnel involved with the internal evaluation, and the internal evaluator. The major responsibility of the internal evaluator following this model is


PLANNING
A
Standard(s)
CIPP (Sub-Standards)
Compare
Discrepancy
Terminate
Performance
Feedback
OPERATION
B
Standard(s)
CIPP (Sub-Standards)
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Discrepancy
Terminate
Performance
Feedback
DEVELOPMENT
C
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CIPP (Sub-Standards)
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Terminate
Performance
Feedback
IMPLEMENTATION
D
Standard(s)
CIPP (Sub-Standards)
Compare
Discrepancy
INDEPENDENT
EVALUATION
Performance
Feedback

to see that relevant project data are collected utilizing the model. In addition, the internal evaluator must work closely with the external evaluator in the refinement of the evaluation model and in providing requested data to the external evaluator. Finally, the internal evaluator must submit quarterly reports to the project director for inclusion in project quarterly reports, and also submit such reports to the external evaluator so that a meta-evaluation of the project can be conducted.

The external evaluator is a sub-contracted expert in evaluation. As indicated above, the external evaluator works closely with the project staff in the development and refinement of the evaluation model. The external evaluator may develop his own evaluation model, or he may perform a meta-evaluation of the project. Project data generated through internal evaluation processes the the specific responsibilities of the external evaluator include:

1. Continue to provide guidance in the development and modification of the evaluation model and data collection instruments and procedures.
2. Provide external monitor, through observational data collection, to insure consistency with the evaluation model and with the goals specified at the onset of the project.
3. Each month review data generated by the evaluation model and provide preliminary formative evaluation reports.
4. Provide written feedback on each of the above for the project staff to be used in a formative sense.
5. Provide quarterly reports as requested by the project staff.

5. People Involved In An Interdisciplinary Curriculum Development Effort Are Different

There are always differences in personality types of people who are brought together to work on an interdisciplinary curriculum development effort. People from different discipline have their own communication styles. They have their own technical language that may be different from that used in other disciplines. People from different disciplines have incorporated into their personal operating styles the structural aspects of their respective disciplines.

One of the major distinctions in people that tends to surface most often in interdisciplinary curriculum development efforts concerns open and closed - mindedness. An interdisciplinary effort is doomed if the people who are to work together are closed-minded. Above all else, people who work on an interdisciplinary project must be willing to accept someone else's ideas. Indeed, people working in interdisciplinary efforts must be willing to move outside their own agenda and be accepting and encouraging of another perons's agenda.

Part of working with another person's agenda involves one recognizing that different people have different communication styles. There are people who are highly verbal while others remain much more quite and seem to be satisfied just to listen to, and observe things that go on. Of course both styles of communication are needed.

One important aspect of communication during an interdisciplinary curriculum development effort is that people need to be good nonjudgemental listeners. Nonjudgemental listening demands that one withhold judgements about other people and their ideas. Nonjudgemental listening is not easy. It is difficult to refrain from adding one's own perceptions and inputs.

Yet another important aspect related to differences in communication patterns is vocabulary differences. Vocabulary differences are extremely crucial in interdisciplinary efforts. Rarely do people from different disciplines share the same technical vocabulary. Yet, if a project is to be successful each person involved must in some way incorporate into his own technical vocabulary system some of the technical vocabulary of his colleagues.

We addressed the vocabulary problem in the Home Energy Project in somewhat of a unique fashion. Throughtout the project different people on the staff would hold a seminar for other staff members during which the sole intent was to teach other staff members some of the language patterns used in a given discipline. These seminars were held much the same as a class would be conducted for udnergraduate students who had never had contact with the discipline.

People who work together in interdisciplinary efforts must acknowledge differences in operating styles of other members of the interdisciplinary team. Some people approach different tasks in a highly structural manner. Often these people will demand high structure for project operations and will be very uncomfortable in a situation that lacks structure. Some people tend to be very analytical, attending to even the most finite detail. Yet other seem to search for broader more global ideas. Of course, each of these operating styles are necessary. The essential task is that regardless of the operating style, a person is assigned to a part of the operation that is congruous with his operating style.

Above all these personal differences, it is extremely important that no one come to the interdisciplinary project with even the slightest notion of superiority or inferiority. Such attitudes simply can not exist if the project is to be successful. No one person can come to an interdisciplinary project believing that he and his input is of greater importance than any one else. Such an attitude can only lead to confrontation and conflict which often can not be resolved.

6. The Institutional Setting Must Be Supportative Of Interdisciplinary Curriculum Development Efforts

The final principle to be addressed in this paper concerns the institutional setting for the interdisciplinary curriculum development project. It is imperative that the institutional setting be supportative of such efforts. The institutional setting must provide the leadership necessary to bring people from differen disciplines together to work on a common task. This leadership and support can manifest itself in providing released time for individuals involved in the interdisciplinary effort.

In addition to providing leadership and released time, the institutional setting should provide facilities and other resources of the interdisciplinary effort is to work successfully. The project often must be housed in a facility that is easily accessible to all staff. Frequently, new facilities and/or materials need to be purchased for such projects.

Summary

Throughout this paper I have attempted to present information related to six principles guiding effective interdisciplinary curriculum development projects. While the focus of the conference and the title of the paper was on designing energy conservation education programs the ideas contained in the paper addressed interdisciplinary projects in general. This attack was taken because of the fact that energy conservation is, by definition, interdisciplinary. Throughout the discussion of each principle I attempted to relate, where possible, information growing out of a project concerned with the design of an educational program in home energy conservation.

Following the principles presented in this paper will not insure that an interdisciplinary curriculum development project will be successful. However, by addressing these principles throughout such a project hopefully one will avoid many of the problems incurred in other similar efforts.

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ENERGY EDUCATION

George Dawson

ABSTRACT

Americans concerned with not only the energy problem, but with its solution must realize that there is no one solution but that they are a part, with government, with technology, with research, with business of a complex venture which cannot be resolved over night. Moral commitment expressed in actions and institutions is necessary.

Legislative power, societal norms, and personal decisions are main routes to the conservation of energy. The personal decision route is the business of education. Educators in schools or other situations are the major preparation agents for the citizens of the future. A student-citizen in education for energy conservation will be informed, aware, and prepared for participation in personal, local, state and national decision and opportunities to conserve energy.

A curriculum designed to develop knowledge, behaviors, skills, and attitudes about energy, and its relation to Living Systems and Social Systems can be adapted to any age group. This curriculum uses a "Springboard" experience as stimulus and is developed by questions and activities.

ENERGY EDUCATION

by

George Dawson

Today more Americans than ever before realize that the energy crisis is real. It is not another in a long series of doomsday forecasts, nor is it another crisis hyped by the media and then forgotten as the new crisis arrive like waves striking the beach.

More Americans are less disposed to look for a villan, and more disposed to search for solutions. We are all, in our own way, the "cause" in a very complex national problem. There is no one solution to our problem. There is no one technological advance, no one ethical principle, no one political decision which will turn our situation around.

A plethora of individual decisions, a set of logically consistent and morally sensitive national, state, and local public policies, and energy reasearch and development are all part of the "solution." Whether we get these or not depends upon the scientific widsom, the economic power and flexibility, and the moral commitment of the American people, expressed in their actions and in the actions of their institutions -- including government and business.

ERDA (Now part of the Department of Energy) recently developed a priorities and time scale for possible national implementation. For the near term, the ERDA plan suggests that a high priority be placed upon supply (increasing the use of our largest fossil resource -- coal, enhancing recovery of gas and oil, and building more nuclear generating facilities). The second area of highest priority was placed upon demand -- energy conservation. Energy conservation, in the ERDA mission, stresses innovations to increased energy use efficiency.

Energy conservation is the only way to bring about rapid change in our energy picture. Of course, energy conservation via more efficient use of energy is a longer term process involving innovative design and technology. But increasing energy awareness, increasing the knowledge base that energy consumers have, and increasing the incentives for energy conservation are means that can be readily applied.

In essence there are three routes to bringing about energy conservation: Legislative power, societal norms, and personal decisions. These are none-exclusive routes.

Legislative Power: Using the power of the state through laws and administrative rulings to (a) manipulate the self-interest of energy consumers and (b) clarify and set forth the ideals that we as a nation think are important.

Societal Norms: Using national consciousness of the energy problem to establish new social attitudes toward energy consumption and conceptions of the good life. These norms would define societal expectations and focus social sanctions.

Personal Decisions: Each of the above routes obviously involve directing personal decisions of millions of American energy consumers. However, the emphasis in this route is to achieve voluntary decisions by persons based upon their own reflections on self-interest considerations, benevolence considerations, of duties, obligations, and personal moral ideas.

Legislative power and societal norms "teach people", but this third route to energy conservation is a basic education venture. As society copes with the need for energy conservation through technological innovation, application, and new knowledge, it will employ legislative and societal norms. Education to affect personal decision-making is traditional in American society. The energy crisis is no exception.

Educators in both the formal and non-formal sectors, as well as educators working with children, youth, and adults have a major role to play as they prepare student-citizens for full participation in a democratic society. Energy education is increasingly a national and a personal need in America. School based educators can have a direct and immediate impact on energy conservation with students. We have defined four general goals for school-based energy education. They are:

Goal #1 The student-citizen will understand the science and technology of energy and its persuasive role in the universe, in living systems, and in human systems (e.g., political, economic, and social).

Goal #2 The student-citizen will be able to make informed and fair judgements on energy options as they arise, being able and willing to participate in the political decision-making process.

Goal #3 The student-citizen will be able to make personal life-style commitments which are consistent with energy realities and are morally responsible.

Goal #4 The student-citizen will be aware of and prepared for participation opportunities in energy conservation efforts at the personal, local, state, and national levels.

With adequate materials and training, educators in our schools can meet these goals, responding both to student and national needs. Technological advances may be spectacular. Direct legislation may offer immediate conservation gains. In the long-run, however, it is the knowledge, abilities, and personal commitments of the citizenry which permit successful responses to crisis. Education offers Americans a way to achieve energy conservation, as part of the personal growth of future citizens.

An Initial Framework of Main Ideas Important to Understanding Energy and Energy Conservation:*

I propose a curriculum development effort based upon the teaching ideas critical to understanding of the complexities inherent in the idea of energy conservation.

We have developed a set of Main Ideas. These Main Ideas are grouped into three functional categories which we refer to as "Strands". They are: The Universe of Energy, Living Systems and Energy, and Social Systems and Energy. They are vital to making energy conservation decisions by persons who are consumers and citizens in a free society. "The Universe of Energy" and "Living Systems and Energy" outline scientific ideas fundamental to comprehending basic energy concepts and energy flow models, of which people are a part. "Social Systems and Energy" set forth fundamental concepts in social systems, including governmental, economic, and moral systems which are vital in decisions affecting the production, distribution, and consumption of energy resources.

This list of Main Ideas is focused upon energy conservation -- decisions by individuals, decisions by groups, and systemic decisions on matters affecting energy resources. These range from when and where to turn on a light bulb, to personal lifestyle commitments, to vast matters of societal planning like urban design and industrial location.

The listing of Main Ideas is tentative. In our first attempts at thinking through these ideas we focused on the elementary school but the general plan is applicable to any level of educational endeavor. These ideas may be employed at the grade levels indicated in the handout. But it is expected that they may be introduced to sutdents at each grade level in a manner appropriate to their degree of reasoning and abstract conceptionalization. Thus a complexity of societal conflict over rights, ideals, interests, and obligations may be discerned by children in Grade three as a conflict faced by an elderly couple budgeting scarce dollars, and hoping to keep their utilities service during a long, and cold winter.

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*The points made in this section are applicable to all curriculum. The K-6 program is only an example in this paper.

Strand A. The Universe of Energy*

Grade Level		
K, 1	1.	Energy is the ability to do work.
K, 1, 4	2.	Energy exists in many different forms, including light energy, electrical energy, chemical energy, mechanical energy, and heat energy.
K, 1	3.	Changes in the motion or position of matter only occur when energy is exerted.
K, 1	4.	Almost all of the energy available on earth comes from the sun.
5, 6	5.	The earth is an open system which constantly receives solar energy and which constantly gives off heat energy.
5, 6	6.	Life can exist on earth only because of the constant and steady arrival of solar energy and the equally steady loss of heat energy into ourter space.
3, 4	7.	Machines and living organisms change energy from one form to another.
5, 6	8.	Energy can be changed, but it can never be created or destroyed.
3, 4	9.	Different forms of energy are able to do different amounts of work.
5, 6	10.	Kinetic energy refers to any form of energy that is actively doing work.
5, 6	11.	Potential energy refers to any form of energy that is inactive or stored. All matter contains potential energy.

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*Extensively rewritten from a schema produced by the John Muir Institute for Environmental Studies, Berkeley, California, under terms of a 1973-74 grant from the U.S. Office of Environmental Education, Grant No. OEG-0-73-5450.

Strand B. Living Systems and Energy

Grade Level	
K, 1	1. All living organisms require energy to maintain such characteristic functions as movement, responsiveness, growth, reproduction, and metabolism.
K, 1	2. Green plants (producers) are the only form of life that can capture the energy available in solar radiation. They do it be means of a chemical reaction-photosynthesis.
3, 4	3. Organisms, like humans, which cannot capture solar energy, obtain energy, from green plants either directly or indirectly. These non-green organisms are consumers.
3, 4	4. Organisms that break down dead animals and plants into molecules and atoms are decomposers. Decomposers are usually bacteria and fungi.
3, 4	5. Feeding relationships between producers, consumers, and decomposers form patterns called "food chains" or "food webs" that describe the paths by which energy is transferred from one organism to another.
5, 6	6. The overall pattern formed by the movement of energy from producers to consumers is a complex food web called an energy pyramid.
5, 6	7. As energy flows through a living system, it imposes order and organization on that system.
5, 6	8. Under certain conditions, energy stored in the tissue of dead organisms may become a fossil fuel.

Strand C. Social Systems and Energy

Grade Level	
K	1. All people must consume energy to stay alive.
3, 4	2. People transform and manipulate energy sources to satisfy their needs and wants.
3, 4	3. People use energy to improve their environmental conditions, to power machines, and to maintain culture.
3, 4	4. People are among the very few organisms that use large quantities of energy resources.
3, 4	5. People have increased their consumption of energy resources throughout history.
5, 6	6. People living in technological cultures have greatly increased their consumption of energy resources in the last few hundred years.

Strand C. Social Systems and Energy--Continued

Grade Level	
4, 5, 6	7. Sources of energy have changed as new types have been found and as old sources have been depleted or found to be less desirable.
5, 6	8. The major sources of energy have changed from renewable ones such as plants and animals to depletable ones such as coal, oil, and natural gas.
5, 6	9. People use energy to create and sustain special ecosytems such as cities, recreation areas, and agricultural areas.
K, 1	10. People have used energy resources to increase agricultural yields and thus increase the amount of food energy available to them.
5, 6	11. People are beginning to look toward energy resources that are non-depletable.
5,6	12. All societies have wants greater than their resources are able to fulfill, creating the condition of scarcity. Economic systems, governmental systems, and moral systems are ways to allocate scarce resources, including energy resources.
4	13. Energy consumers have interests, obligations, rights, and ideals which govern their personal and collective consumption of energy resources.
4	14. Energy producers have interests, obligations, rights, and ideals which govern their production and distribution of energy resources.
4	15. Social systems, including government, the economy, and societal networks, have interests, obligations, ideals, and rules affecting the production, distribution, and consumption of energy resources.
4	16. Individuals, groups, and the society-at-large faces conflicts in self-interests, obligations, rights, and ideals as they make choices or rules affecting the production, distribution, and consumption of energy resources.
5, 6	17. Energy conservation deals with increasing the efficiency of energy use and decreasing the amount of energy used.
4, 5, 6	18. Social systems that regulate energy supplies and use are important components in energy conservation.
4, 5, 6	19. People as energy consumers and decision-makers are individually and collectively responsible for energy conservation.

Components in the Educational Sequence

To accomplish our major goals, materials would have to be provided to help students ask the right questions and to assist in developing beliefs (knowledge), values, and skills as needed. Teachers will need to be assisted through teacher education materials to facilitate learning and to learn with students.

A useful learning-process model called the Borton Model* which can be used to raise questions in energy education emphasizing thinking, experiencing, and sharing seems to us to provide a framework upon which to construct a program.

(Springboard)

Figure 1

The features of the model are personal concerns and experiences, central knowledge and value, skills decision making.

Personal Concenrs: Refer to such items (as opposed to needs, wants, and interests), as power, identity, ego-strength, belonginness, trust, competency, usefulness, connectedness, etc. This includes a direct link to the learner's experience (psychological lifespace). These lead to central knowledge and value concerns.

Central Knowledge Concept: Examples of this are: Alienation, cause-effect, social change, conflict, political power, rational consent, leadership, reference group, cognitive dissonance, etc. This includes rational-empirical, personal, and normative critical knowledge.

Central Value Concept: Examples are: equality, equity, justice, honesty, respect for the dignity of persons, freedom, impartiality, consideration of interests, dignity of life, etc. With changing knowledge and values, skill development can take place.

Skill Development: Examples: Creativity-imagination, Empathy-role-taking Social participation, Strategy planning, Cognitive inquiry skills, Group building skills, Communication skills, Ethical reasoning skills, Research skills.

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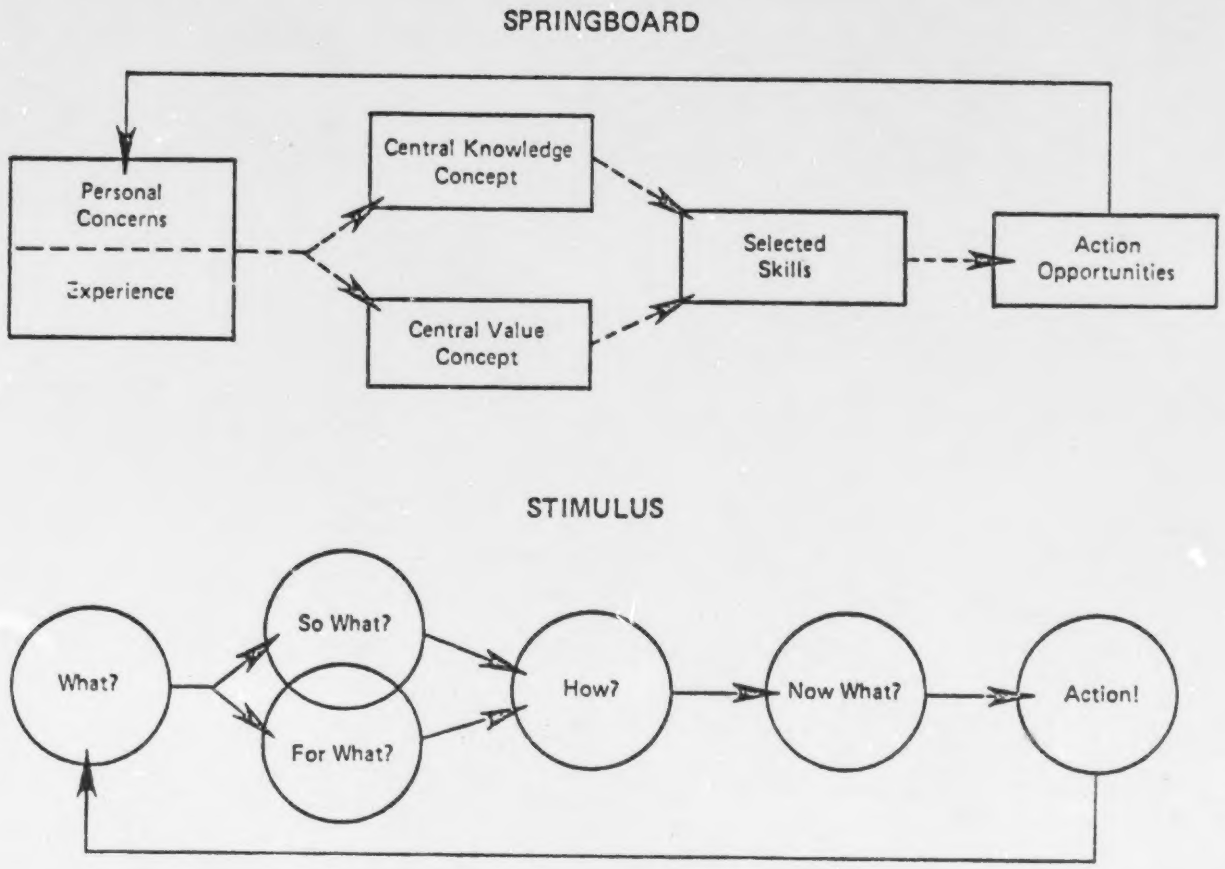
*Modified from Terry Borton, Reach, Touch and Teach, McGraw-Hill, New York, 1970.



SPRINGBOARD

STIMULUS

Personal Concerns
Experience
Central Knowledge Concept
Central Value Concept
Selected Skills
Action Opportunities
What?
So What?
For What?
How?
Now What?
Action!

Borton Model (1970)

Figure 1

Another way of looking at the model is also illustrated in the lower sequence of the figure. This view uses non-technical language to illustrate the model.

The teacher uses a springboard as a stimulus. That sprigboard may be a poem to read, a song to sing or a ten-minute mini-walk out-of-doors. It offers students an interesting experience and evokes curiosity.

The teacher or the activity assignment then asks students to reflect upon the springboard experience. WHAT? questions are used to create personal awareness of something related to energy conservation (i.e., energy, a mine, a campfire burning) or to create personal awareness of some response in-here, inside themsleves (i.e., the way they feel, what they think, what they value).

The teacher or the activity assignment then asks SO WHAT? questions so that students may reflect on the meaning that they make of the phenomena that they are aware of. So what if people waste energy? So what if you believe that it is okay to leave the doors open to an air conditioned house?

These questions are followed by FOR WHAT? questions. What values do you place on what you have become aware of? Is energy loss desirable or undesirable? Why? Is the behavior of those friends and family worthy and related to the way you feel energy resources should be utilized?

HOW? questions are used throughout the process. Many skills are developed and used. Communication skills, inquiry skills, reasoning skills, and creative abilities have a part to play. Students need to learn how to share their thoughts effectively with others. They need to learn how to pose inquiry questions, shape hypotheses, and collect information by careful observation. They need to be able to give reasons to justify a judgement, or to ask questions about another's positions. They need to know how to communicate their feelings, values, and positions in creative ways -- art, song, essays, short stories, poems, etc. And, of course, the students need to develop social participation skills so that they can speak coherently before a group, write letters to officials, and work sensitively and effectively with others in a group.

NOW WHAT? questions ask students to decide upon a new way to think, feel, value, or act. For that you are aware of something. It is significant to you and you understand it, what do you want to do? What action do you want to take?

An ACTION simply provides the opportunity for students to do something which they have decided upon -- paint a picture, alter their value priorities, work for the conservation of an open-space, or to role up their sleeves and devote a Saturday to sealing windows and doors to reduce energy loss.

EVALUATION ABILITIES serve as a feedback loop. That is, teachers and students reflect upon the process which they have just gone through. What went right? What went wrong? What can we do differently?

This learning process could be the basis for the activities of any comprehensive Energy Resources Conservation Curriculum Project.

We suggest that educational materials have the following major characteristics:

1. Activity Centered:

The overall recommendation from our meeting with teachers, scientists, administrators, and our field experience indicates that the program should be activity centered to the fullest extent possible.

There is much reserach to inidcate that students learn best when manipulative materials are available. Likewise, activities such as games and plays are well documented with regard to their contributions to learning.

Several very successful science curriculum development efforts for the K-6 students have been activity-based. Many elementary schools in this country use either the Science Curriculum Imporvement Study (SCIS) or Science: A Process Approach (SAPA), or the Elementary Science Study (ESS) programs. Outside of the sciences, several mathematics and reading programs (SRA, is the more notable example) use the "hands-on" approach to instruction. Teachers will respond favorably to a program that is activity centered because they are familiar with this approach.

2. Action Centered with Immediate Payoff to School Children and Their Families:

We suggest an energy conservation program that is both interesting and useful to school children and their families. It is our belief that the activities should lead to an immediate act of energy both within the school room and at home. Materials would be designed in such a way that some action is required.

3. Discrete Units:

Units that are discrete in their content yet have unifying themes throughout the grades must be produced. Our observation of energy conservation materials currently available is that such unification has not occurred. The basic idea here is that certain concepts will be emphasized at specific grade levels but the idea (or strand) will be expanded upon at other grade levels. For example, the need for alternative energy sources may be a major idea of a study unit. However, this idea could be a subordinate idea presented at other grade levels.

Units that permit group and/or Individualized activities to take place can be developed. A teacher can choose then to have activities done by all students at the same time or let students work at their own pace. But instructions must be given for the activities that will permit a student to get materials and carry out activities with little procedural comments from the teacher.

4. Open-Ended:

"Open-ended" activities should be characteristic of any program included for students. Students should be presented a problem to investigate that would require the application of an energy conservation concept.

Problems that are both of a scientific interest and of a social nature must be included. Open-ended investigations enable students to learn at their own pace by maximizing their creativity.

5. Interdisciplinary:

Mathematical and reading concepts should be integrated into the units. Primary level units might require simple addition and subtraction of whole numbers. Later units could require use of decimals. The teacher could be given assistance in teaching these math and reading concepts by inclusion of methods in a teacher's edition of the student materials.

Integrating energy conservation themes into math, social studies, reading, and science programs makes such a project much more attractive to schools as they usually have a minimum amount of time to devote to special programs like energy conservation. By making this program meet the requirements of state departments of education with regard to the class time that must be devoted to science, math, and reading, the program will not become an additional burden but rather can be viewed as a laboratory for the teaching of these topics.

6. Low Material Costs:

In this day of tight budgets, costs must be kept low. This can be accomplished by using items that are low cost or free, such as baby-food jars, string, corrugated boxes, leftover paint, sand, etc., that could be brought from home. However, for the convenience of teachers who may not have the time or the mechanics to purchase small items, all materials must be available from a supplier.

There very likely would have to be some utilization of specialized items such as an "energy house," windmills, and perhaps a solar converter for use in different grades.

We suggest that limited use of audiovisual materials take the place of least important materials due to the high costs involved in their development. We would anticipate that some topics at least may have to be supported with movies, tape-slides, and sound film strips.

Reading skills perhaps, can be supported with audio cassette tapes, read-along books, that would parallel instruction given via the printed page. This provision is made so that reading skills could be practiced, or that the poor reader could learn about energy conservation at nearly the same rate at the good reader.

The printed page should have an open appearance. Instructions on setting up and carrying out activities will be accompanied by illustrations.

Appendix A includes prototype examples of an upper and a lower elementary grade activity. They illustrate how tying together of the instructions and illustrations can take place.

7. Extensive Teacher Material:

A major part of any Curriculum Project is the development of a flexible management scheme for program inplementation. Such a scheme should:

a. Suggest alternative ways to sequence the materials for students with different learning styles, and

b. Develop an in-service instructional module for teachers that will provide key content material relating to energy conservation as well as giving suggestions on organizing equipment, sources of materials, and other relevant information.

After reviewing many of the currently available materials we have found that all fall short of including these attributes that from our viewpoint are critical if we are serious about changing our nations knowledge with regard to energy conservation.

Some agency or foundation must exercise the leadership to fund a comprehensive educational plan immediately.

Apendix A

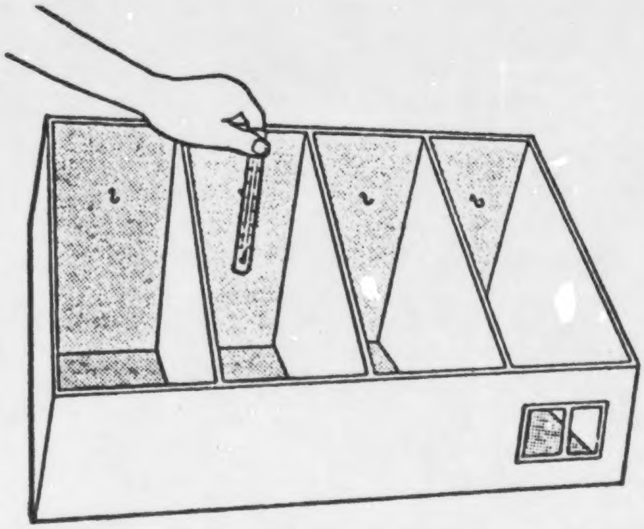
Problem

Could the color of a roof make a difference in the temperature of your house?

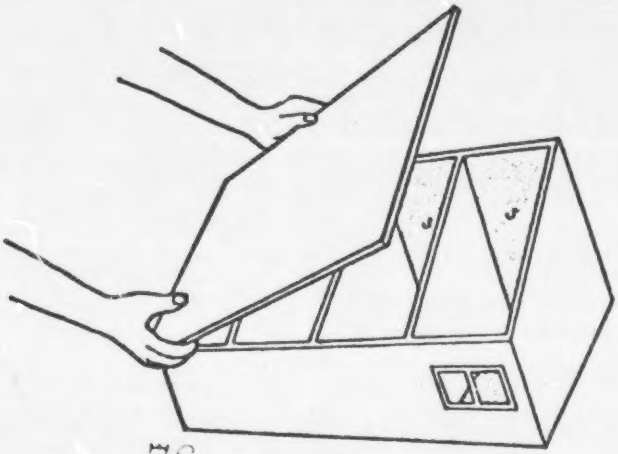
Go to the supply area and bring back to your work area the following items:

A-1 energy house
B-1 thermometer
C-1 thermometer holder
D-1 heat source (sun or sun lamp)

Activity 1. Place the thermometer in the middle thermometer holder.



Activity 2. Place the roof on the house with the white side facing out. Place the house in the sun or under the heat lamp. Wait 5 minutes and take the temperature of the air inside the house.



Activity 3. While you are waiting, answer the following questions:

1. Do you think that the temperature of the house with the white roof on will be higher than the temperature of the house with the black roof on? Why?

2. What type of graph will you draw to show the difference in temperatures in the house? Make two graphs while you are waiting for the temperature to change. Make a graph showing what you think the temperature difference will be. Using the thermometer readings, make another graph showing the actual readings.

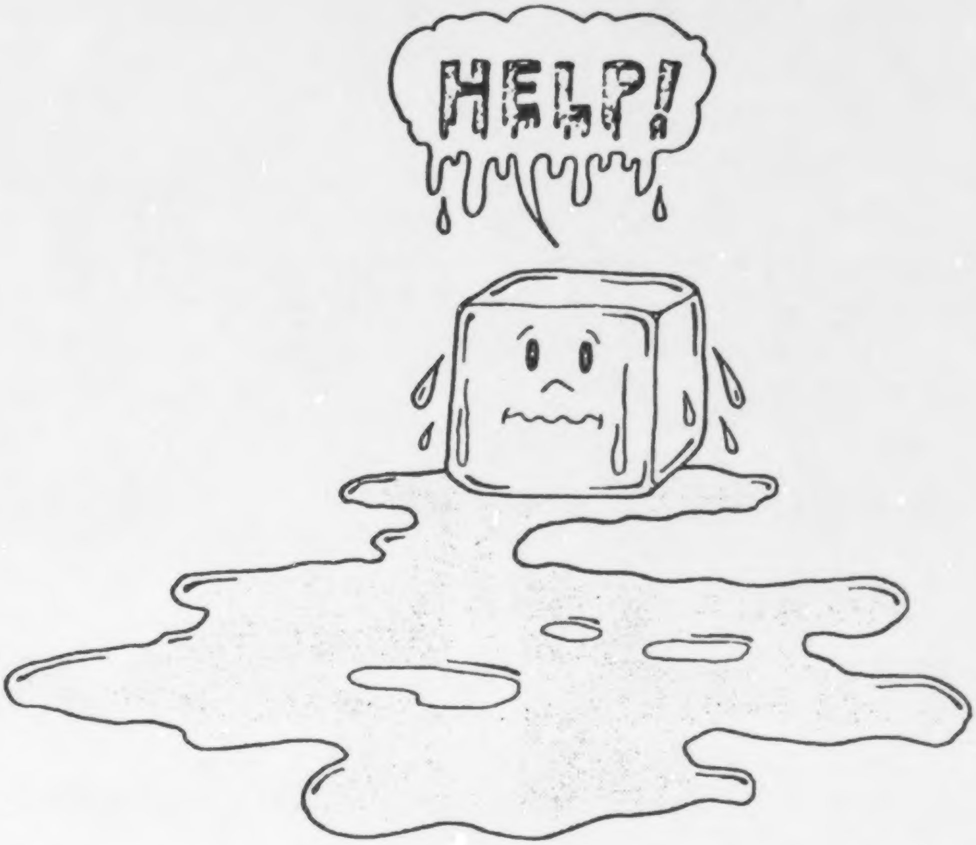
An example of a lower alementary grade activity is:

Idea: How insulation conserves heat.

Materials: Various types of insulation material such as paper, corrugated board, cloth, and styrofoam should be abailable for the students to use.

One ice cube per student or pair of students.

Action: Have the students plan how they might keep their ice cube from melting longer than anyone les. Give them time to plan. Let them carry out their suggestions. Do not tell them to use the insulation materials, but permit them if they ask. At the end of the activity, have those that were most sucessful share with the others how they kept the ice from melting and why they protected the ice the way they did.



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His other interests are in the inservice education of personnel, test construction and competency based teacher education. Dr. Dawson has also worked extensively in the Arab world through Arab League Educational Scientific and Cultrual Organization (ALESCO).

ENERGY CONSERVATION EDUCATION:
A PERSPECTIVE FOR EVALUATORS

James K. Duncan

ABSTRACT

To develop a perspective for evaluation of energy education, the "technical definition" of education proposed by Dewey is used:

> "[education] is that reconstruction or reorganization of experience which adds to the meaning of experience and . . . increase ability to direct the course of subsequent experience."
>
> Democracy and Education

Energy conservation education presents two major problems. First, it is cross-disciplinary, dealing with several disciplines simultaneously. The functional background of experience of the learner is important in cross-disciplinary studies. Second, the energy conservation programs must be directed at knowledge and attitudes and changing behavior

Evaluation of energy education program must deal with the effects of small increments of learning or modest changes of attitude which possibly could affect perhaps significantly, future behavior. These changes are in the form of new meanings to past experiences and an increased ability to continue future energy related experiences.

ENERGY CONSERVATION EDUCATION:
A PERSPECTIVE FOR EVALUATORS

by

James K. Duncan*

Introduction

Does it make any difference in the field of energy conservation whether we think of providing for human comfort by using active systems or passive systems in the design and construction of homes?

Two years ago I could not have asked this question. I did not know the difference between an active and a passive system in this context. Nor did I realize how important human comfort was in determining the courses of action most people take with respect to the use of energy.

At the time I first discovered the difference between active and passive systems[1] and their use in providing for human comfort I was somewhat embarrassed. As the external evaluator on the University of Houston's Home Energy Conservation Project I should have known the difference. I had read their proposal and it clearly stated that they would focus attention on the use of passive systems - not on the use of active systems in conserving energy. The significance of the difference between active and passive systems had not registered in my mind. It had not affected my way of thinking nor become a part of my experience. Perhaps that was because my understanding of human comfort, energy conservation, and home building was very simple-minded. This was especially true if my understanding was compared to the sophisticated understanding possessed by architects and/or professional home builders.

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*Gerald Mager, Paul Burden and Jessica Jahnke, all of whom have worked with the author in the area of educational evaluation contributed to the ideas expressed here and made editorial suggestions for the final manuscript.

[1] Passive systems use natural means to provide for human while active systems use mechanical techniques.

Nevertheless, it became increasingly clear to me as time went on that if one approached problems of human comfort by thinking in terms of passive systems instead of active systems in the impact on energy conservation might be considerable.

I cite this personal experience to focus attention on a question of some importance in the evaluation of educational programs in energy conservation.

> In the field of energy conservation education what effects can small increments of understanding have on our ways of thinking, feeling and behaving with respect to the conservation of energy?

Another example may help illustrate the thrust of the question. In one of the "fact booklets" developed for the Home Energy Conservation Project you will find the following statement: "infiltration alone accounts for 55% of the heating load and 41% of the cooling load of a typical living unit."

> What effect does that bit of knowledge have on your understanding of the relation between the twin concerns of human comfort and your fuel bills? What effects might that bit of knowledge have on a prospective home-buyer's understanding? What effect might it have on a home-builder's understanding.

I am, of course, very wary of generalizing from my own experience, especially in an area as complex as the home-building industry. I felt this more deeply while engaged as the external evaluator of an educational program in energy conservation directed at participants in the home-building industry. This leads me to describe one more personal experience for the purpose of focusing attention on a question of importance to evaluators of educational programs in energy conservation.

In my role as external evaluator to the Home Energy Conservation Project I felt a need to consult with someone in the home building industry to discover how they might react to the proposed program. I had a friend who is a small-scale homebuilder. He is knowledgable about more than home-building yet he is deeply involved in all aspects of the financing, building and marketing of homes. The connections and continuities in his adult experience are centered in the home-building industry. Unlike me has was not simple-minded in these regards.

I shared with him some of the materials being developed by the Home Energy Conservation Project and asked him to react to them in any way he wished. He talked to me for three hours one Sunday afternoon. I listened. He talked of fireplaces, heat-pumps, landscaping, bank financing, incentives, insulation, climates, electric heating, public attitudes toward energy shortages and many other critical considerations that he thought important in a realistic, down-to-earth treatment of energy conservation in the building and marketing of homes.

I left that conversation wondering about my own simple-minded view of the importance of small increments of understanding. Could they have any impact on persons with experiential backgrounds as complex and thoroughly-based in life experience as the experiential background of this man? Could small increments of understanding, modest changes in attitudes or in skills have any significant effects on the energy conserving practices of those professionals making their living in the home building industry?

I do not have an answer to that question. I do know that in a filed as complex as energy conservation no short-term educational experience, in-and-of-itself, can do more than provide for small increments of understanding and/or modest changes in attitudes and skills. And this leads me to my second fundamental question.

> How can small increments of understanding and/or modest changes in attitudes and skills change our ways of thinking, feeling and behaving in an area as complex as the conservation of energy?

Two questions, then, seem to me to be central to understanding the impact that energy conservation education may have. They have to do with what effects small increments of learning can have in human experience and how these small increments can produce these effects, especially in areas of human experience as complex as energy conservation. In my view the evaluator of educational programs in energy conservation needs a perspective that will help him to focus attention on how the small increments of experience that are provided by the educational program interact with the learners experience to produce significant energy conserving effects in the learner's future experience. I shall propose a perspective that might be helpful in this regard and later discuss the implications this perspective seems to me to have for evaluators. First, though, I should like to comment briefly on two characteristics of educational programs in energy conservation that might distinguish them from some other kinds of educational programs.

Characteristics of Educational Programs in Energy Conservation

Two particular characteristics of the field of energy conservation seem to have bearing on the kind of educational programs that are likely to be developed in energy conservation education. These grow out of the ideas that

(1) the knowledge and understanding necessary to deal with the problems of energy conservation come from a number of different disciplines; and (2) increased capacity to deal with energy conservation problems is probably related simultaneously to increased knowledge, changed attitudes and improved skills.

Energy conservation education as cross-disciplinary: Most educational programs in energy conservation are likely to be cross-disciplinary in nature. That is, the subject matter making up the program will be drawn from different disciplines.

The Home Energy Conservation Project, for example, developed an educational program directed toward participants in the home building industry. Although energy conservation is the context of the building and marketing of homes. Because it is in this mixed context that energy conservation can have the greatest meaning for them, an educational program for them should draw upon the fields of both marketing and architecture.

The Home Energy Conservation Project drew from the subject matter of both fields. There were difficulties associated with integrating the disciplines but the project staff believed that you can't talk to builders about designing energy conserving homes without simultaneously talking to them about selling the redesigned homes.

There is no way of knowing what disciplines may need to be brought to bear in the development of a variety of different educational programs in energy conservation. That depends, at least, upon the area of energy conservation that the program is to deal with and the experiential background of those to whom the program is directed.

Perhaps it should be said in passing that educational programs that deal with common social concerns and problems are very often cross-disciplinary in nature (e.g., environmental education, problems in American democracy, the role of women in society).

Cross-disciplinary educational programs tend to rely more heavily on the functional background of experience the learner has in the area of study than they do on the specific subject matter knowledge attitudes and skills incorporated in the learner's experience. In this sense, at least, educational programs in such disciplines as mathematics, biology or economics. This difference appears to have implications for evaluators. In cross-disciplinary programs it becomes important to understand how the functional experience of the learner interacts with the educational experience provided by the program.

The role of knowledge, attitudes and behavior: It is sometimes useful to determine whether educational programs are to be directed primarily at (a) increasing knowledge, (b) modifying attitudes or (c) changing behaviors. In the case of energy conservation education one might ask should educational programs in energy conservation be directed primarily at (a) increasing knowledge about energy conservation, (b) modifying attitudes toward energy conservation or (c) changing the behaviors of those involved in energy-related activities? Which of these is most important in any given program of energy conservation education? That is hard to say. Some would argue that changed behavior is the critical criterion for judging the effects of any educational program. Perhaps this is true for some educational programs. In energy conservation education one might well ask if changes in energy conserving behavior are not based on knowledge of energy conserving principles and practice and on positive attitudes toward efforts to conserve energy are these changes likely to be flexible enough and durable enough to make a real difference in our efforts to conserve energy?

Energy conservation education appears to be complex in this regard. Oriented as it is to a social problem of our time it would seem that efforts might well be directed at all three outcomes - increasing knowledge, changing attitudes and changing behaviors. Some educational programs can afford the luxury of concentrating primarily on one of these dimensions of an educative experience. Perhaps, educational programs in energy conservation cannot. If this is true, the educational evaluator needs to employ a perspective that will simultaneously acknowledge and deal with the part played by knowledge, attitudes and behavior in human experience.

Energy conservation education appears to be cross-disciplinary in nature and seek ultimately to produce changes in all three aspects of the learner's experience - his knowledge, his attitudes, and his behavior. These two general characteristics of educational programs in energy conservation have implications for evaluators of such programs. Taken in conjunction with the two questions raised earlier in this paper - namely:

(1) What significant effects can small increments of learning (i.e., increased knowledge, changed attitudes, or changed behavior) have in human experience? and

(2) How can such small increments of learning produce significant effects in areas of human experience as complex as that of energy conservation?

They suggest the need for a perspective on what constitutes an educative experience in energy conservation education; a perspective that might be especially useful in energy conservation education.

In this particular instance, the concern is for a perspective useful to evaluators. One that will enable the evaluator to raise questions about the nature of educational programs in energy conservation, how they might function and what their educational effects are likely to be; a perspective on the educative experience, not a model for conducting evaluations of educational programs. A perspective on cross-disciplinary educative experiences and on experiences that attempt simultaneously to deal with knowledge, attitudes and behaviors as they function in human experience. A perspective that focuses attention on the effects of education in the subsequent experience of the learner.

Energy Conservation Education as the Reconstruction or Reorganization of Experience

In 1926, John Dewey proposed what he referred to as a "technical definition of education." It appeared in the book Democracy and Education and it read as follows:

> [education] is that reconstruction or reorganization of experience which adds to the meaning of experience and which increases ability to direct the course of subsequent experience.[2]

He presumed that education was based in past experience, that it consisted of some reconstruction or reorganization of that experience and the results of that reconstruction or reorganization were (1) an increase in the meaning of experience and (2) an increase in ability to direct or control subsequent experience.

With respect to the results to be expected from an educative experience he wrote:

> (1) the increment of meaning corresponds to increased perception of the connections and continuities of the activities in which we are engaged.

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[2] J. Dewey, Democracy and Education New York: Macmillan, 1926. p. 89

> (2) The other side of an educative experience is an added power of subsequent direction or control [of future experience].[3]

If a program of educative experiences in energy conservation is viewed from this standpoint at least four essential questions would be raised.

> (1) What is the nature of the learner's experience relative to energy conservation?
>
> (2) How does the program propose to help the learner reconstruct or reorganize that energy conservation experience.
>
> (3) In what way will the program enable the learner to add meaning to his energy conservation experience.
>
> (4) In what way will the program increase the learner's ability to direct his future energy conservation experience?

An educational program intervenes in the chain of the learner's experience. He may have been building and selling homes or planning to buy a home. He may have been engaged in any one of a number of activities associated with using energy. He brings to the educational program a unique background of experience in energy conservation and a unique set of "connections and continuities" in his energy related activities. In Dewey's view the educational program would help the learner reconstruct or reorganize that unique background of experience by adding meaning to that experience by adding meaning to that experience and increasing his ability to direct or control his future experience.

For the home buyer this might mean (1) a better understanding of the relationships among the design and construction features of his present home, his comfort in that home and his utilities bills; and (2) an ability to examine critically the comfort and energy-saving characteristics of the new homes that builders may be trying to get him to buy.

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[3] Ibid, p. 90

The perspective on energy conservation education that is proposed here grows directly out of Dewey's definition of education. He would argue that educational experiences which fill the requirements of this definition are truly educative. Be that as it may, this perspective does suggest a number of lines of questioning an evaluator might use when trying to judge the effectiveness or potential effectiveness of an educational program in energy conservation; lines of questioning that other perspectives might not emphasize or suggest.

Implications for Evaluators

The learner's experience: If educational programs in energy conservation are to build upon the background experience of the learner with a view to helping the learner reconstruct or reorganize that experience there are some questions an evaluator should ask:

(1) Whose experience is to be reconstructed or reorganized?

(2) What procedures will the program planners use to determine the nature of the learner's experience?

(3) Will these procedures provide valid and reliable information on the nature of the learner's experience?

and finally, before serious work is begun on developing the educational program--

(4) What is the nature of the learner's energy-related experience that is the basis for developing the educational program?

(5) Is the understanding of the learner's experience adequate for the task of planning the educational program?

The "subject matter" of the program: The educational program will intervene in the experience of the learner. A second line of questioning has to do with the nature of the educational program itself and the potential meanings the program might have in the learner's experience. It will be helpful to deal with this line of questioning in two parts; the first dealing with the substance or subject matter of the educational program and the second dealing with the instructional practices of the program.

With respect to the subject matter of the educational program the evaluator might ask:

(1) Is the knowledge base sound from an energy conservation viewpoint?

(2) Can the knowledge base be functionally realted to the learner's experience?

(3) Does the knowledge have potential for adding meaning to the experience of the learner?

(4) Are the attitudes fostered sound from an energy conservation viewpoint?

(5) Will the attitudes fostered be reasonably acceptable to the learner?

(6) Do the fostered attitudes have the potential for adding meaning to the experience of the learner?

(7) Are the behaviors or skills to be developed functional from an energy conservation viewpoint?

(8) Will the behaviors or skills be functional in the energy conservation experience of the learner?

(9) Do the behaviors or skills to be developed have potential for adding meaning to the learner's experience?

Instructional practices: In general, the purpose of instruction is to facilitate learning. In the perspective proposed here instruction should facilitate the reconstruction or reorganization of the learner's experience. It should enable the learner to add meaning to his experience and to increase his ability to direct or control subsequent experience. This all suggests the following line of questioning for the evaluator.

(1) Do the instructional practices encourage the learner to bring his own experience to bear on problems associated with energy conservation?

(2) Do the instructional practices "present" knowledge attitudes and skills in ways that encourage interaction between the learner's experience and the experience provided in the educational program?

(3) Do the instructional practices facilitate the learner's efforts to reconstruct or reorganize meaningfully his own experience?

(4) Do the instructional practices facilitate the learner's efforts to consider and use alternative courses of action with respect to energy conservation in his future experience?

In a scientific sense there is not much known about what constitudes effective insturction. Here, the evaluator may need to use a large measure of professional judgment. He can sometimes turn to a related field of study and discover bases on which proposed insturctional practices might be judged.

For example, in the Home Energy Conservation Project at the University of Houston the project staff and the evaluators believed that some degree of attitude change was desireable. They turned to the literature on attitude change and identified the following approaches to changing attitudes:

(a) counter-attitudinal role-playing,
(b) practicing behaviors associated with new attitudes,
(c) providing new technologies to enable the learner to implement new attitudes,
(d) employing channels of influence to create expectations in keeping with new attitudes,
(e) employing incentive or rewards for responding in keeping with new attitudes and
(f) providing new knowledge that supports new attitudes.

These potential approaches to attitude change were used as one basis for judging the likely effectiveness of some insturctional practices. Although the effectiveness of instructional practices may be difficult to judge, the evaluator needs to pay special attention to them in this perspective because the learner's interaction with the substance of the educational program depends upon them.

The third, and for this paper, final line of questioning for evaluators has to do with the potential the program has for increasing the learner's ability to direct his future experiences in energy conservation. This is perhaps the most difficult line of questioning for the evaluator, at least in the sense that answers are not readily found and when found are usually not clear and convincing.

Ability to direct future experience: In energy conservation education one would hope that the learner would apply the principles and practices of conservation in any of his future experiences that dealt with energy usage. The educational program would contribute to that end by increasing his ability to direct or control his energy-related activities. As is too often the case, in education, the crucial test of a program's effectiveness lies in its effects on the future life experience of the learner. And again, as is so often the case, evaluators have learned to settle for some less than crucial tests of program effectiveness. Some of these "less than crucial" tests of the effectiveness of an educational program in energy conservation education are suggested by the following line of questioning.

(1) Does the program increase the learner's ability to understand his own past experience relative to the use of energy?

(2) Does the program increase the learner's ability to understand a variety of his past experiences in terms of principles and practices of energy conservation?

(3) Does the program increase the learner's ability to use energy conservation principles and practices in planning his own energy related activities?

(4) Does the program increase the number of functional courses of action open to the learner that he might successfully employ in the energy conservation field?

(5) Does the program increase the ability of the learner to find and use support (there are many kinds, e.g., social, political, scientific) for functional courses of action he might pursue in the field of energy conservation?

SUMMARY:

The perspective proposed here directs attention to two outcomes of an educative experience. One is the meaning that is added to the learner's experience. The other is the increased ability to direct or control future experience. These outcomes grow out of the learner's efforts to reconstruct or reorganize his own experience. An educational program in energy conservation education may be viewed as an effort to *guide and support a reconstruction or reorganization of the learner's experience in a way that insures that the principles and practices of energy conservation give new meaning to his experience and increase his ability to control his future energy-related experiences*.

This perspective may be particularly helpful to the evaluator working in a cross-disciplinary field like energy conservation. It may provide a rationale for the evaluation of programs where it is hoped that small increments of learning may have very significant effects on future behavior. It may provide a rationale for understanding how such small increments of knowledge or modest changes in attitudes or skills might be expected to contribute directly to very significant changes in human understanding and human behavior.

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A LEARNING PACKAGE IN ENERGY CONSERVATION FOR PARTICIPANTS IN THE HOME BUILDING INDUSTRY

Ranjit K. Banerji

ABSTRACT

Residential and commercial facilities account for about a fifth of the total national energy consumption in the United States. Energy conservation practices can significantly reduce energy consumption. This project assumes that by educating the major users of energy in conservation techniques along with the research and development of alternative energy sources, an enduring solution to the problem of energy shortage can be found.

One such major group of users is the home building industry. Traditionally, the prime goal of all participants in home building industry has been to construct and sell a dwelling unit in the quickest and least costly means possible. Energy consciousness in design and building has not been a consideration. This project undertook the development of a technique, on an experimental basis, for educating the above group in building energy conserving homes. The issues the project had to deal with are the deficiencies in present knowledge status, effective marketing techniques for energy conserving homes and the attitudinal barriers toward adoption of these techniques.

A LEARNING PACKAGE IN ENERGY CONSERVATION FOR PARTICIPANTS IN THE HOME BUILDING INDUSTRY*

by

Ranjit K. Banerji

Introcduction

The energy demand for residential commercial uses accounts for about one fifth of the total energy consumed in the United States[1]. It is obvious that there is a considerable waste of energy in buildings. This situation did not pose itself as a matter of concern to participants in the building industry in view of perceived abundance of supply of conventional energy. But now, "the sudden termination of a period of cheap and abundant energy is likely to present us with a set of problems which are quite unlike those of the last 25 years, although they are by no means unprecedented in human experience..."[2]

Thus problems of energy shortage and their implications are coming into focus and requiring Federal, State and Local intervention. But governmental intervention is likely to be of little consequence in such a fundamental problem as energy shortage, unless consumers in all categories believe that a problem exists.

A study[3] undertaken at Princeton University of a large housing development called Twin Rivers, indicated that energy conservation was a low priority

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[1] Bureau of Mines, U.S. Energy Through the Year 2000 (Department of Interior, Washington, D.C., December 1972).

[2] Kenneth E. Boulding in "Science", April 19, 1974, vol. 184 No. 4135

[3] "An Analysis of the Development Process at Twin Rivers" by Harrison Fraker and Elizabeth Schorske, Princeton Univ. Center for Environmental Studies.

concern to nearly all participants who were connected in some way with the planning, design, financing and construction of Twin Rivers. The Princeton researchers found that the prime goal of the participants was to construct and sell dwelling units in the quickest and least costly means possible. Unless design features and construction techniques contributed to quicker construction and lower costs they were not adopted.

The measures which have been recommended recently by many to deal with the situation range from greater use of controls and standards to monetary incentives. Very little emphasis has been laid or attempt has been made or even suggested toward bringing about an attitudinal change in actors involved with the building industry. It is contended that developing a positive attitude is a prerequisite to achieving acceptance of or cooperation in applying the energy conservation measures in the building industry.

Further, there is ample evidence to support another contention, that an attitudinal change can be affected through appropriate education and information.

Based on the above contentions this author and his associates* have attempted to develop a process for educating the builders and financiers involved with building and financing homes.

The process involved the following major steps--

1) Determining the specific attitude of the target population, so that the knowledge content as well as the delivery system for transmitting the knowledge could be designed to be most effective.

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*Dr. Truman D. Whitfield, formerly of University of Houston, Department of Curriculum and Instruction and Dr. Norman Kangun, University of Houston, Department of Marketing.

2) Identifying the educational program needs which were to be met by the instructional delivery system.
3) Designing the instructional delivery system and materials which would be most effective for meeting educational needs.
4) Implementing the instructional delivery system.
5) Evaluating the effectiveness of the program.

Determining the specific attitude of the target population:

A questionnaire was constructed and was personally administered to a sample of builders, consumers* and financiers. Among other things, the questionnaire sought to collect information about: (a) the respondents' feelings about the energy shortage, (b) factors contributing to the energy shortage, (c) their knowledge about ways of conserving energy in the construction of residential dwellings, (d) their evaluation of several design concepts which would conserve energy in single-family dwellings, (e) their perception of buyer decision factors in buying homes, (f) marketing programs, specifically sales appeals currently being used to sell new homes and (g) their present sources of information concerning planning, design and construction of single-family dwellings.

The questionnaire was to be administered to respondents through a personal interview as opposed to administration by either telephone or mail. Given the complex nature of the subject, the personal interview provided us with greater flexibility than the other methods of communication. Some questions were asked of some respondents and not others. For example, financial intermediaries were asked whether incorporating certain design concepts in single-family dwelling units which conserve energy enhances its mortgage financing attractiveness. Further, interviewers were able to probe for more information when answers seem unclear or incomplete. Questionnaires can be longer and more complex with personal interviews than with telephone or mail. Finally, since the questionnaire used pictures (design concepts) the personal interview was the only suitable communication method to use.

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*Consumer's (recent home buyers) were surveyed so that their awareness of energy conserving techniques and attitude toward energy conservation can be compared with those of builders.

The questionnaire itself sought to illicit both factual information and attitudinal measures from respondenes. Consequently, it contained different types of questions, open questions, multiple choice questions, and attitudinal questions, which rely on measuring scales. Given the importance of knowing the attitudes of respondents toward energy conservation in single-family dwellings units, the principal thrust of the questionnaire was in measurement of attitudes. Consequently, many of the questions involved the use of purely ordinal scales. In the case of purely ordinal scales, they serve to rank respondents according to some characteristic such as favorability toward an idea; i.e., energy conservation. Such scales make no attempt to measure the degree of favorability. However, attitudes frequently are complex and difficult to measure. In an effort to improve measurement, indirect approaches to the problem have been developed. One common approach, utilized in our questionnaire, particularly in the Evaluation of Energy Saving Concepts* was to rely upon Likert Scales. In this case, respondents are asked to indicate the degree of agreement or disagreement (effectiveness/ineffectiveness, use/non-use) with each concept statement. Each degree of agreement is given a numerical score, thus enabling us to ascertain the attitudes of respondents toward these concepts.

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*Energy saving concepts are such design features as various ways of shading glass areas, various ways of introducing natural ventilation through homes and so on.

The field work started in November 1975 for the following groups of respondents: home buyers, builders/developers and financiers. We conducted 300 interviews in this phase of the study with respondents in four cities: Houston, Austin, San Antonio, and Beaumont. The marketing research firm of Higginbotham Associates of Houston, was contracted for conducting the personal interviews in the four cities.

Our concern for purposes of this project, was with respondents located within the study area which has been identified in the project proposal as a region within approximately two hundred miles of Houston.

Accordingly, we restricted ourselves to this goegraphical area and to the four dominant cities in the area where the vast majority of residential construction, takes place. Houston, being the largest city in the region, accounts for most of the residential construction, and, as one would expect, contained the majority of our sample respondents.

The sample itself, is a nonprobability sample. Respondents, with the exception of home buyers, are small in number, easily identified and stratified by number of units built, dollar volume, number of mortgage loans made annually, so that our sample of 200 (excluding home buyers) will account for much of the construction and lending activity in this region. Consequently, the data obtained from our sample, even though not a probability sample, is likely to be a representative sample. The bias, therefore, of generalizing the results to the larger universe of respondents is likely to be minimal. Further, the cost and time requirements for probability sampling made it unfeasible.

Some of the significant findings regarding the builder sample were as follows:

1. A total of 43% of the builders definitely believed that there is an energy shortage.
2. Forty-three percent of the builders rated residential dwellings and extremely or very important for energy conservation. While dwellings ranked fourth behind automobiles, manufacturing plants and commercial buildings were rated as extremely or very important source of energy savings.
3. When asked to rate factors consumers consider in the purchase of a new home, only 8% of the builders rated energy saving design features as extremely important. Of the eleven factors rated, this factor ties with "efficiency rating of central air system" for the tenth position in the number of respondents saying it was extremely important in the purchase decision, above only landscaping. The percentage of builders rating energy saving design features as extremely or very important did increase to 40% but only moved up to eighth in the proportion of builders saying it is extremely or very important.
4. In response to questions regarding energy related knowledge the only factor rated extremely important in conserving energy by more than half the builder sample is insulation of attic and walls (88%). Combining responses of extremely and very important, insulation remains the factor most often cited as very or extremely important in conserving energy. Ventilation of attic space and size, amount, and location of window space were considered to be extremely or very important by a large majority of the sample (89% and 84% respectively).
5. Four factors (natural ventilation of rooms, light colored exterior walls, proper lighting design, and window space that can be shaded/exposed) were rated as unimportant in conserving energy by approximately a quarter of the builder sample.
6. Only 34% of the respondents knew that horizontal shading devices protect more efficiently around southern exposures. Builders tend to underestimate the potential effectiveness of proper lighting design in reducing energy consumption.

Particular attention was paid to these areas in teaching builders about energy conservation in the design and construction of homes.

Some of the significant findings regarding the financiers sample were as follows:

1. A slight majority (51.9% of the financial officers definitely

believed there is an energy shortage. Another 31% were of the opinion that there seems to be an energy shortage. This compares favorably with the builder sub-samples.

2. Among those financial officers who believed an energy shortage exists, approximately 70% rated "waste of energy in the design and operation of homes" as an extremely/very important factor contributing to our energy shortage. This rating exceeded the builder sub-sample by a small margin (3%).
3. Approximately 26% of the financial officers rated residential dwellings as an extremely important source of energy savings whereas another 38% rated it as very important. This percentage was quite close to the builder.
4. In terms of factors that are considered important in approving a mortgage loan, 21% of our respondents considered energy savings design features as extremely or very important. This factor ranked well below location (91%) and builder reputation reputation (67%); correspondingly, approximately 43% of the financial officers rated this factor as unimportant. Similarly, amount and type of insulation and average monthly energy cost were rated as unimportant by about 1/3 of our respondents.
5. Despite the findings in number 3, slightly more than 1/3 of our respondents evaluated monthly costs in relation to the monthly mortgage payment when making mortgage loans all the time. Thirty percent do this some of the time while 35% never do so.
6. Less than 1/2 of our respondents have written instructions for those who review loan applications. Of the remainder having written instructions, only 1 in 6 have instructions which cover how to evaluate energy savings features of new homes.

The Instructional Needs

The surveys of builders financiers, consumers and analysis of data were completed by June 1976. These surveys indicated the instructional need for raising the theoretical knowledge base and relating the same to various design features in homes which would conserve energy and indicating the economic trade offs. The instructional needs were categorized under four major areas:

1) Energy and People
2) Energy and Site
3) Energy and Building
4) Energy Conservation and Marketing

Energy and People: deals with people's need for energy to maintain adequate human comfort. This major area serves as the basic foundation of the entire learning program. Two critical subjects are covered within this area - (i) Human Comfort (ii) Role of Climate.

Human Comfort is a topic basic to the design of homes. Environmental conditions contributing to human comfort and their relationship to passive design features in dwellings are explored within this topic.

Climate is the second topic under the heading Energy and People. Regardless of the approaches people take in seeking adequate human comfort, various climatic conditions must be considered.

The second main area of concentration is the Energy and Building Site. Instructions within this area deal with the critical considerations involved in planning subdivisions. These considerations include the study of influences of site characteristics such as ground slopes, trees and ground cover on air temperature, relative humidity and air movement, and in turn on the consumption of energy by dwellings.

The third major area is Energy and Building. Instructions within this area include the effects of (1) various materials on energy consumption in dwellings (2) building shapes (3) orientations, size and construction of windows (4) shading of glass areas (5) natural ventilation and (6) daylighting.

The last major area Economic Evaluation and Marketing Energy Conserving Design Features is two-fold:

1) Describing a computer program for undertaking economic evaluation of energy conserving design features in homes.
2) Discussing some of the techniques for marketing energy conserving homes.

Design of Instructional Delivery System and Materials

The instructional delivery system called for a series of workshop sessions totalling approximately eighteen contact hours. This was primarily due to the amount of information that was to be imparted to the participants and the follow-up activities associated with the information sets.

The number of participants in each session varied from fifteen to thirty. Initially it was decided that participants would be divided into small groups with a miximum of fifteen, and a team of three facilitators representing architecture, education and marketing in order to maximize group interaction. However, once the instructional program was implemented it was found that a group as large as thirty to thirty-five can be handled by one facilitator with the help of the Facilitator's Manual* and assisted by another person familiar with audio-visual equipment. The presence of staff from architecture and marketing sometimes did help in responding to follow-up questions or directing a discussion. Since the learning package was meant to be used eventually by a facilitator not necessarily with a background in architecture, the issue of questions and answers outside the manual has been addressed in the manual.

The activities during the workshop sessions focus on the use of passive systems in single-family dwellings as a means of conserving energy. The four major areas of concentration and their contents described earlier were organized on a three-day schedule. Following the first round of workshops it was realized that the workshops would function better with six evening sessions of three hours each. The reason for this modification will be discussed in greater detail in the next section of this paper.

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*This manual provides an introduction to each workshop session and specifies procedures for the activities, suggestions for discussion, and all materials needed. Scripts for the presentations are included in this manual.

During the workshop sessions several modes of instruction were employed depending on the complexity of a particular topic and the most suitable medium of instruction for such a topic. For example, instruction in Human Comfort, which is a rather abstract concept, 16mm animated sound film was used in explaining the concept. Following the film presentation participants were encouraged to discuss several issues related to human comfort, e.g., as a general rule what kinds of corrective measures would one have to take with regard to four environmental characteristics (temperature, relative humidity, air movement and radiation) to achieve a comfortable state in August and February in the participant's city?

With regard to another topic, for example, Role of Climate, the mode of instruction is a slide-tape presentation followed by discussion and problem solving. Yet, in the case of another topic - Design Integration, which involved applying the theoretical knowledge from various sessions into the development of an energy conserving house design, used video tape to illustrate the design process. After exploring other media it was found that video tape recording was the most suitable medium to develop this rather complex topic in a very simple manner.

Another feature of the delivery system was the take-home materials which the participants were provided with for later reference. The take-home materials contained highlights of the audio-visual presentations regarding various topics covered in the workshop sessions. This avoided taking extensive notes by participants during the audio-visual presentations.

Implementing the Instructional Delivery System

Invitation to participate in the workshops were sent to builders and representatives of financial institutions within the study area (Houston, San Antonio and Austin). We had originally anticipated a total of 120 participants. However, we received 45 requests from Houston, 20 from Austin and 20 from San Antonio. When the three day workshop began our attendance was as follows: Houston, 19, Austin 12, and San Antonio 13. Several would-be participants indicated that it was very difficult to give up three days at the office for the sessions. Based on these feedback we arranged a second round of workshop consisting of six three hours sessions in the evenings, spread over three weeks.

During the planning stage we felt that we would need two facilitation teams to present the workshops. However, the smaller enrollment resulted in our using one three-person team. The team consisted of a representative from Education, Architecture and Marketing.

As the program was being implemented with the target population, we identified a number of minor changes that needed to be made either in the program or in its mode of presentation. These changes resulted in a much smoother operation of the session. The changes primarily concerned the reallocation of time to various components, expanding the directions for some activities and making additions to some of the program materials to facilitate a better understanding.

A second round of workshops was necessitated due to the rather low response to the first round. Due to the modified schedule, the response to the second round was considerably better. There were 40 requests from Houston, 39 from Austin and 20 from San Antonio. Twenty-eight of the Houston participants, 21 Austin participants and 9 San Antonio participants completed the workshops.

Follow-up Service

The follow-up service consisted of providing the participants with economic evaluation of energy conserving design features which anyone might be thinking of incorporating in the homes following the workshops. This evaluation tool consisted of a computer program which was developed by the project staff. The builders provided the project office, in response to a questionnaire, a detailed list of the various design components of the dwelling indicating dimensions, material selections, orientations, efficiency of heating and cooling equipment and estimated selling price. The project staff converted this questionnaire into a computer format and the information was then run through the computer program.

The computer printout (pages 107,108) which is returned to the participants, gives the estimated selling price of the home with a given set of energy conserving design features and month by month heating and cooling costs. The printout also provides total yearly heating and cooling costs for the original design and for a design with a set of modifications. Only three sets of modifications, along with the original design are analyzed and ranked in order of life cycle costs per year per design. Life cycle cost is the total amount which will be paid out by the consumer for the mortgage, operation and maintenance of the home. By examining this ranking of life cycle costs one can tell which design option is the most cost-effective.

The life cycle costs is an important decision factor for the builder, the consumer and the financier in building, buying and financing energy conser-

```
                           SUMMARY
     THE ORIGINAL DESIGN AND CHANGES WHICH YOU HAVE PROVIDED ARE
LISTED AND ORDERED BELOW ACCORDING TO ENERGY RELATED LIFE - CYCLE COSTS
PER YEAR.  LIFE - CYCLE COST PER YEAR REPRESENTS A COMPOSITE VALUE
WHICH INCLUDES THE PRINCIPAL AND INTEREST FOR THE INITIAL MORTGAGE
OF THE HOME, YEARLY MAINTENENCE OF ENERGY RELATED MATERIALS, AND
THE YEARLY OPERATING COST TO HEAT AND COOL THE HOME.  LIFE - CYCLE
COSTING PROVIDES A GOOD MEASURE FOR THE EVALUATION OF ENERGY DESIGN
DECISIONS IN THAT IT REPRESENTS AN APPROXIMATE FIGURE EQUAL TO
WHAT THE CONSUMER WILL SPEND PER YEAR FOR A PARTICULAR HOME.  IF AN
ENERGY RELATED DESIGN CHANGE CAUSES AN INCREASE IN THE INITIAL
COST OF THE HOME, THE INCREASED YEARLY PRINCIPAL AND INTEREST
MUST BE OFF SET BY REDUCED YEARLY OPERATING AND MAINTENENCE COSTS.
IF THIS IS ACHIEVED, THE CONSUMER WILL SAVE MONEY THROUGH THE DESIGN
CHANGE.

                      COMPARTITIVE ANALYSIS

                      !----------------!
                      !      ! LIFE    !
                      !      ! CYCLE   !
                      ! CASE ! COST    !
                      !----------------!
                      !    3 ! 8087.12 !
                      !    0 ! 8111.50 !
                      !    2 ! 8155.44 !
                      !    1 ! 8175.15 !
                      !----------------!

 FOLLOWING IS AN ITEMIZED ECONOMIC DATA SHEET FOR THE
ORIGINAL AND EACH OF THE CHANGES YOU HAVE SUBMITTED.
```

NOTE: THE COSTS INDICATED ON THIS PRINT-OUT MAY NOT REFLECT THE ACTUAL COSTS WHICH THE CONSUMER IS LIKELY TO INCUR, BECAUSE THIS ANALYSIS DOES NOT RECOGNIZE THE IMPERFECTIONS IN ACTUAL ON-SITE CONSTRUCTIONS ANY MORE THAN WHAT IS NORMALLY ASSUMED IN HEATING AND COOLING LOAD CALCULATIONS.

```
                      OPTION CASE  0

 THE ESTIMATED SELLING PRICE OF THIS HOME IS $  77500.00 .

       !-------------------------------------------------!
       ! MONTH       ! HEATING  ! COOLING  ! TOTAL      !
       !             ! COST ($) ! COST ($) ! COST ($)   !
       !-------------------------------------------------!
       ! JANUARY     !   41.01  !    1.57  !    42.58   !
       ! FEBRUARY    !   28.99  !    2.09  !    31.08   !
       ! MARCH       !   18.67  !    5.68  !    24.35   !
       ! APRIL       !    2.27  !   14.76  !    17.03   !
       ! MAY         !     .00  !   21.90  !    21.90   !
       ! JUNE        !     .00  !   45.99  !    45.99   !
       ! JULY        !     .00  !   57.99  !    57.99   !
       ! AUGUST      !     .00  !   54.28  !    54.28   !
       ! SEPTEMBER   !     .00  !   40.57  !    40.57   !
       ! OCTOBER     !    2.37  !   19.71  !    22.08   !
       ! NOVEMBER    !   15.28  !    3.62  !    18.90   !
       ! DECEMBER    !   32.93  !    1.06  !    33.99   !
       !-------------------------------------------------!
       ! YEARLY      !  141.38  !  275.10  !   416.48   !
       ! TOTAL       !          !          !            !
       !-------------------------------------------------!

      IF THE CONSUMER TAKES ADVANTAGE OF THE VENTILATION WHICH THIS PLAN
 PROVIDES  THE YEARLY OPERATING COST WILL BE REDUCED TO $  400.30 .
 AMOUNTING TO A SAVINGS OF $    16.18 PER YEAR.

  LIFE CYCLE COST PER YEAR OF THIS DESIGN EQUALS $ 8111.50 .
```

```
                    OPTION CASE  1

 THE ESTIMATED SELLING PRICE OF THIS HOME IS $  78487.00 .

          !-----------------------------------------------!
          ! MONTH       ! HEATING  ! COOLING  ! TOTAL     !
          !             ! COST ($) ! COST ($) ! COST ($)  !
          !-----------------------------------------------!
          ! JANUARY     !    36.32 !     1.44 !    37.76  !
          ! FEBRUARY    !    25.67 !     1.99 !    27.66  !
          ! MARCH       !    15.50 !     5.33 !    21.83  !
          ! APRIL       !     2.01 !    14.00 !    16.00  !
          ! MAY         !      .00 !    30.25 !    30.25  !
          ! JUNE        !      .00 !    43.62 !    43.62  !
          ! JULY        !      .00 !    51.20 !    51.20  !
          ! AUGUST      !      .00 !    51.47 !    51.47  !
          ! SEPTEMBER   !      .00 !    33.47 !    33.47  !
          ! OCTOBER     !     2.10 !    18.69 !    20.79  !
          ! NOVEMBER    !    13.53 !     3.43 !    16.96  !
          ! DECEMBER    !    29.07 !      .99 !    30.06  !
          !-----------------------------------------------!
          ! YEARLY      !   125.19 !   260.89 !   386.08  !
          ! TOTAL       !          !          !           !
          !-----------------------------------------------!

    IF THE CONSUMER TAKES ADVANTAGE OF THE VENTILATION WHICH THIS PLAN
PROVIDES  THE YEARLY OPERATING COST WILL BE REDUCED TO $  370.74 .
AMOUNTING TO A SAVINGS OF $   15.34 PER YEAR.

 LIFE CYCLE COST PER YEAR OF THIS DESIGN EQUALS $ 8175.15 .

                    OPTION CASE  2

 THE ESTIMATED SELLING PRICE OF THIS HOME IS $  78721.84 .

          !-----------------------------------------------!
          ! MONTH       ! HEATING  ! COOLING  ! TOTAL     !
          !             ! COST ($) ! COST ($) ! COST ($)  !
          !-----------------------------------------------!
          ! JANUARY     !    32.81 !     1.28 !    34.09  !
          ! FEBRUARY    !    23.19 !     1.76 !    24.95  !
          ! MARCH       !    14.91 !     4.72 !    19.62  !
          ! APRIL       !     1.81 !    12.39 !    14.20  !
          ! MAY         !      .00 !    26.78 !    26.78  !
          ! JUNE        !      .00 !    38.61 !    38.61  !
          ! JULY        !      .00 !    45.32 !    45.32  !
          ! AUGUST      !      .00 !    45.55 !    45.55  !
          ! SEPTEMBER   !      .00 !    34.05 !    34.05  !
          ! OCTOBER     !     1.89 !    16.55 !    18.44  !
          ! NOVEMBER    !    12.22 !     3.04 !    15.26  !
          ! DECEMBER    !    26.25 !      .89 !    27.14  !
          !-----------------------------------------------!
          ! YEARLY      !   113.09 !   230.92 !   344.02  !
          ! TOTAL       !          !          !           !
          !-----------------------------------------------!

    IF THE CONSUMER TAKES ADVANTAGE OF THE VENTILATION WHICH THIS PLAN
PROVIDES  THE YEARLY OPERATING COST WILL BE REDUCED TO $  330.44 .
AMOUNTING TO A SAVINGS OF $   13.58 PER YEAR.

 LIFE CYCLE COST PER YEAR OF THIS DESIGN EQUALS $ 8155.44 .

                    OPTION CASE  3

 THE ESTIMATED SELLING PRICE OF THIS HOME IS $  77243.78 .

          !-----------------------------------------------!
          ! MONTH       ! HEATING  ! COOLING  ! TOTAL     !
          !             ! COST ($) ! COST ($) ! COST ($)  !
          !-----------------------------------------------!
          ! JANUARY     !    41.01 !     1.52 !    42.50  !
          ! FEBRUARY    !    28.99 !     2.09 !    31.08  !
          ! MARCH       !    18.63 !     5.62 !    24.25  !
          ! APRIL       !     2.27 !    14.76 !    17.03  !
          ! MAY         !      .00 !    31.90 !    31.90  !
          ! JUNE        !      .00 !    45.99 !    45.99  !
          ! JULY        !      .00 !    53.99 !    53.99  !
          ! AUGUST      !      .00 !    54.28 !    54.28  !
          ! SEPTEMBER   !      .00 !    40.57 !    40.57  !
          ! OCTOBER     !     2.37 !    19.71 !    22.08  !
          ! NOVEMBER    !    15.28 !      .62 !    13.90  !
          ! DECEMBER    !    32.83 !     1.05 !    33.89  !
          !-----------------------------------------------!
          ! YEARLY      !   141.38 !   275.10 !   416.48  !
          ! TOTAL       !          !          !           !
          !-----------------------------------------------!

    IF THE CONSUMER TAKES ADVANTAGE OF THE VENTILATION WHICH THIS PLAN
PROVIDES  THE YEARLY OPERATING COST WILL BE REDUCED TO $  400.30 .
AMOUNTING TO A SAVINGS OF $   16.18 PER YEAR.

 LIFE CYCLE COST PER YEAR OF THIS DESIGN EQUALS $ 8087.15 .
```

ing homes. A builder cannot build unless he or she is reasonably sure that the homes will sell. The consumer cannot buy unless the added yearly expenses for an energy conserving home is offset by the savings in energy bills. The financier is interested in recovering the added expense within a reasonable period of time. It was necessary for us, therefore, to indicate to the participants how much and what modifications can be made to existing systems of buildings to be cost-effective and increase salability.

Evaluating Effectiveness of the Program

As of this date three measurement periods have been analyzed--before, after, and three to four months after. In the case of the control group, all three surveys were conducted by mail with a random sample of builders in New Orleans. In the case of the test group as discussed earlier, the first questionnaire was administered at the first session of the workshop, the second questionnaire at the end of the last workshop session, and the third questionnaire was sent to the respondent in the mail. All questionnaires for each measurement period and for both test and control groups were self administered.

The fourth measurement period questionnaire will be mailed to respondents approximately eight to nine months after they completed the questionnaire for measurement period number one. When the results of the fourth measurement questionnaire are available, the data analysis will be performed in order to test the following hypotheses*:

1. There will be no gain in knowledge of energy conservation practices in home building exhibited by participants as a result of partici-

---

*These hypotheses for testing were postulated by Dr. James K. Duncan, the external evaluator for the project.

pation in the Home Energy Conservation workshops.

2. There will be no gain in attitude favorable toward energy conservation in home building exhibited by participants as a result of participation in the Home Energy Conservation workshops.
3. There will be no gain in desposition to behave favorably toward energy conservation in home building exhibited by participants as a result of participation in the Home Energy Conservation workshops.

At this time a summary of the data collected thus far is presented. Some of the significant findings are summarized below.

Table 1 shows that for the three energy items the control group increased more than the test groups. But the test group rated the energy items higher in degree of importance. This comparison is made for periods one and three. In order to explain why the control group increased at a higher rate for the energy items, we would have to know more about what happened in the control city during the measurements period.

Table 2 shows that the test group increased more in eight out of the eleven items surveyed related to conserving energy in the home. The control group increased significantly higher on two items related to glass area and amount of windows. This might indicate a regional difference or that a promotion by manufacturers of windows and glass doors was conducted in the control area during the measurement period.

Table 3 shows a significant increase among the test group when asked to estimate how much external shading devices will reduce solar heat that would normally be transmitted through a glass window pane. The average who consider the following actions to be effective is increasing more than it is among the control group:

Change roof material to one that is more energy efficient

Incorporate natural ventilation of rooms into home plan
Change shape of the house you build
Use proper type shading for exposed glass areas
Layout subdivisions considering wind pattern
Apply lighter colors in interior spaces
Minimize paved areas on the building lot

And for this action, the trend still favors the test group but not to the same degree as above:

Orient the house on the lot in consideration of sun

Table 5 evaluates what builders are either now doing or planning to do in the future to incorporate energy saving materials and design features into their building plans. The test group ranks ahead of the control group in the trend of how many are either doing or planning to do the following:

Change shape of the house you build

The control group ahead on the following:

Change roof materials to one that is more energy efficient
Minimize paved areas on the building lot

Table 6 shows that the control group ranks ahead of the test group in terms of increasing numbers who now do or plan to use the following marketing strategies:

Provide the prospective buyer with an energy consumption analysis of the house
Point out the energy saving features of the house you build
Use audio-visual materials to communicate energy saving advantages

In summary, it appears that to date the program has been more effective in educating the builders and in changing their attitudes than in changing their actions.

*ENERGY CONSERVATION STUDY*UNIVERSITY OF HOUSTON*COLLEGE OF ARCHITECTURE*NEW GRANT NO. G00-75-02108*

TABLE 1 IMPORTANCE OF FACTORS THAT MIGHT INFLUENCE A NEW HOME SHOPPER TO BUY FROM A SPECIFIC BUILDER

	TEST GROUP				CONTROL GROUP			
	SURVEY				SURVEY			
	1	2	3	4	1	2	3	4
BASE (NUMBER OF RESPONDENTS)	40	40	40	-	26	26	26	-
AVERAGE RATING GIVEN FACTOR...								
BUILDER'S REPUTATION	4.75	4.20	4.55	-	4.88	4.96	4.88	-
TOTAL PRICE OF HOUSE	5.26	5.20	5.40	-	5.40	5.42	5.65	-
ENERGY SAVING DESIGN FEATURES	4.55	4.90	5.00	-	3.65	3.62	4.27	-
EFFICIENCY RATING OF CENTRAL AIR	4.25	4.50	4.75	-	3.31	3.35	4.15	-
AMOUNT AND TYPE OF INSULATION	4.80	5.10	5.20	-	3.73	4.00	4.69	-
LANDSCAPING	3.25	3.60	4.10	-	2.52	2.50	3.12	-

001

SCALE 6 = EXTREMELY IMPORTANT
1 = EXTREMELY UNIMPORTANT

TABLE 2 RATING OF IMPORTANCE OF SPECIFIC ITEMS ON CONSERVING ENERGY IN A NEW HOME

	TEST GROUP				CONTROL GROUP			
	SURVEY				SURVEY			
	1	2	3	4	1	2	3	4
BASE (NUMBER OF RESPONDENTS)	40	40	40	-	26	26	26	-
WHETHER AGREE OR DISAGREE AVERAGE RATING FOR EACH ITEM...								
LIGHT COLOR EXTERIOR WALLS	4.05	4.95	5.05	-	3.88	4.23	4.62	-
LIGHT COLOR ROOF	4.32	5.50	5.10	-	4.28	4.42	4.96	-
INSULATION OF ATTIC AND WALLS	5.70	5.95	5.95	-	5.69	5.85	5.84	-
AMOUNT/LOCATION OF WINDOWS/DOORS GLASS	5.60	5.65	5.80	-	4.68	5.04	4.96	-
PROPER LIGHTING DESIGN	4.35	4.65	4.70	-	3.77	3.69	3.77	-
VENTILATION OF ATTIC SPACE	5.25	5.35	5.40	-	5.12	5.04	5.23	-
LOCATION OF OUTSIDE VEGETATION	4.58	4.90	5.25	-	3.57	3.73	4.04	-
SITING OF UNIT ON LOT RELATION TO SUN	4.90	5.20	5.30	-	3.71	3.96	3.96	-
SHAPE OF BUILDING	4.55	4.90	4.90	-	3.20	3.65	3.58	-
NATURAL VENTILATION OF ROOMS	4.35	4.95	5.00	-	3.27	3.50	3.58	-
LARGE AMOUNT OF GLASS AREA THAT CAN BE SHADED IN SUMMER/EXPOSED WINTER	4.42	4.90	4.60	-	3.42	3.38	4.15	-

002

SCALE 6 = EXTREMELY IMPORTANT
1 = EXTREMELY UNIMPORTANT

TABLE 3 PER CENT WHICH EXTERNAL SHADING DEVICES WILL REDUCE SOLAR HEAT TRANSMISSION

	TEST GROUP				CONTROL GROUP			
	SURVEY				SURVEY			
	1	2	3	4	1	2	3	4
BASE (NUMBER OF RESPONDENTS)	40	40	40	-	26	26	26	-
PER CENT TRANSMISSION REDUCED...								
NONE	-	-	-	-	-	-	-	-
1-9	-	-	-	-	-	-	-	-
10-19	5.0	-	-	-	3.8	7.7	7.7	-
20-29	10.0	10.0	5.0	-	15.4	11.5	23.1	-
30-39	10.0	15.0	5.0	-	-	11.5	7.7	-
40-49	10.0	5.0	-	-	7.7	11.5	11.5	-
50-59	30.0	20.0	40.0	-	30.8	19.2	26.9	-
60-69	15.0	25.0	10.0	-	-	7.7	7.7	-
70-79	5.0	10.0	15.0	-	7.7	3.9	-	-
80-89	10.0	15.0	-	-	-	-	-	-
90-100	5.0	-	20.0	-	-	3.9	-	-
NOT REPORTED	-	-	5.0	-	34.6	23.1	15.4	-
TOTAL	100.0	100.0	100.0	-	100.0	100.0	100.0	-
AVERAGE PER CENT	10.65	16.50	18.37	-	15.88	3.00	12.64	-

008

TABLE 4 RATING OF EFFECTIVENESS OF ACTIONS THAT COULD BR TAKEN TO CONSERVE ENERGY IN THE DESIGN AND CONSTRUCTION OF SINGLE FAMILY HOUSES

	TEST GROUP				CONTROL GROUP			
	SURVEY				SURVEY			
	1	2	3	4	1	2	3	4
BASE (NUMBER OF RESPONDENTS)	40	40	40	-	26	26	26	-
AVERAGE RATING FOR EFFECTIVENESS								
CHANGE ROOF MATERIAL TO ONE THAT IS MORE ENERGY EFFICIENT...	2.30	1.70	1.95	-	1.88	2.08	2.19	-
INCORPORATE NATURAL VENTILATION OF ROOMS INTO HOME PLAN...	2.11	1.80	1.84	-	2.46	2.58	2.42	-
CHANGE THE SHAPE OF THE HOUSE YOU BUILD...	2.75	2.20	2.16	-	3.04	3.04	3.19	-
USE PROPER TYPE SHADING FOR EXPOSED GLASS AREAS (WINDOWS & GLASS DOORS)...	1.90	1.45	1.42	-	2.12	2.15	2.00	-
ORIENT THE HOUSE ON THE LOT IN CONSIDERATION OF SUN...	1.85	1.65	1.47	-	2.42	2.35	2.12	-
LAYOUT SUBDIVISIONS CONSIDERING WIND PATTERN FOR NATURAL VENTILATION...	2.47	1.90	1.95	-	2.88	3.15	2.69	-
APPLY LIGHTER COLORS IN INTERIOR SPACES USED IN THE DAYTIME...	2.55	2.00	1.84	-	2.77	2.73	2.73	-
MINIMIZE PAVED AREAS ON THE BUILDING LOT...	2.50	1.85	1.68	-	2.52	2.15	2.04	-

011

SCALE 1 = EXTREMELY EFFECTIVE
6 = EXTREMELY INEFFECTIVE

TABLE 5 WHICH OF THE FOLLOWING DO YOU PLAN TO INCORPORATE INTO YOUR BUILDING PLANS (FINANCE REQUIREMENTS) WITHIN THE NEXT 12-MONTHS

	TEST GROUP				CONTROL GROUP			
	SURVEY				SURVEY			
	1	2	3	4	1	2	3	4
BASE (NUMBER OF RESPONDENTS)	40	40	40	-	26	26	26	-
TYPE OF ACTION								
CHANGE ROOF MATERIALS TO ONE THAT IS MORE ENERGY EFFICIENT...								
NOW DO SO	5.0	15.0	10.0	-	11.5	7.7	19.2	-
WILL DO IN FUTURE	20.0	35.0	30.0	-	26.9	34.6	46.2	-
NOT SURE	50.0	30.0	35.0	-	26.9	26.9	7.7	-
WILL NOT DO IN FUTURE	25.0	20.0	25.0	-	34.6	30.8	26.9	-
INCORPORATE NATURAL VENTILATION OF ROOMS INTO HOME PLANS...								
NOW DO SO	30.0	25.0	20.0	-	23.1	11.5	19.2	-
WILL DO IN FUTURE	35.0	45.0	45.0	-	30.8	46.2	34.6	-
NOT SURE	30.0	25.0	20.0	-	15.4	19.2	15.4	-
WILL NOT DO IN FUTURE	5.0	5.0	15.0	-	30.8	23.1	30.8	-
CHANGE SHAPE OF THE HOUSE YOU BUILD...								
NOW DO SO	-	5.0	15.0	-	-	7.7	7.7	-
WILL DO IN FUTURE	10.0	30.0	20.0	-	15.4	19.2	7.7	-
NOT SURE	60.0	40.0	35.0	-	23.1	23.1	23.1	-
WILL NOT DO IN FUTURE	30.0	25.0	30.0	-	61.5	50.0	61.5	-
USE PROPER TYPE OF SHADING FOR EXPOSED GLASS AREAS (WINDOWS & GLASS DOORS)...								
NOW DO SO	10.0	15.0	10.0	-	15.4	3.8	7.7	-
WILL DO IN FUTURE	30.0	40.0	30.0	-	26.9	26.9	34.6	-
NOT SURE	45.0	35.0	35.0	-	23.1	30.8	26.9	-
WILL NOT DO IN FUTURE	15.0	10.0	25.0	-	34.6	38.5	30.8	-
ORIENT THE HOUSE ON THE LOT IN CONSIDERATION OF SUN...								
NOW DO SO	-	10.0	-	-	15.4	11.5	11.5	-
WILL DO IN FUTURE	40.0	45.0	45.0	-	11.5	23.1	23.1	-
NOT SURE	35.0	25.0	25.0	-	19.2	19.2	11.5	-
WILL NOT DO IN FUTURE	25.0	20.0	30.0	-	53.8	46.2	53.8	-
LAYOUT SUB DIVISION CONSIDERING WIND PATTERN FOR NATURAL VENTILATION...								
NOW DO SO	-	-	-	-	7.7	-	3.8	-
WILL DO IN FUTURE	20.0	25.0	20.0	-	11.5	11.5	19.2	-
NOT SURE	55.0	45.0	40.0	-	15.4	23.1	26.9	-
WILL NOT DO IN FUTURE	25.0	30.0	40.0	-	65.4	65.4	50.0	-

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(CONTINUED PAGE 2)

*ENERGY CONSERVATION STUDY*UNIVERSITY OF HOUSTON*COLLEGE OF ARCHITECTURE*HEW GRANT NO. G00-75-02108*

TABLE 5 WHICH OF THE FOLLOWING DO YOU PLAN TO INCORPORATE INTO YOUR BUILDING PLANS (FINANCE REQUIREMENTS) WITHIN THE NEXT 12-MONTHS

	TEST GROUP				CONTROL GROUP			
	SURVEY				SURVEY			
	1	2	3	4	1	2	3	4
APPLY LIGHTER COLORS IN INTERIOR SPACES USED IN THE DAYTIME...								
NOW DO SO	25.0	30.0	35.0	-	50.0	46.2	69.2	-
WILL DO IN FUTURE	25.0	45.0	30.0	-	23.1	23.1	19.2	-
NOT SURE	35.0	20.0	20.0	-	7.7	7.7	3.8	-
WILL NOT DO IN FUTURE	15.0	5.0	15.0	-	19.2	23.1	7.7	-
MINIMIZE PAVED AREAS ON THE BUILDING LOT...								
NOW DO SO	20.0	10.0	15.0	-	23.1	42.3	53.8	-
WILL DO IN FUTURE	30.0	50.0	45.0	-	46.2	42.3	26.9	-
NOT SURE	25.0	30.0	20.0	-	11.5	3.8	-	-
WILL NOT DO IN FUTURE	25.0	10.0	20.0	-	19.2	11.5	19.2	-

012

TABLE 6 WHICH OF THE FOLLOWING DO YOU PLAN TO INCORPORATE IN YOUR MARKETING PLAN TO SELL HOMES

	TEST GROUP				CONTROL GROUP			
	SURVEY				SURVEY			
	1	2	3	4	1	2	3	4
BASE (NUMBER OF RESPONDENTS)	40	40	40	-	26	26	26	-
TYPE OF PLAN PROVIDE THE PROSPECTIVE BUYER WITH ENERGY CONSUMPTION ANALYSIS OF THE HOUSE								
NOW DO SO	5.0	10.0	-	-	7.7	7.7	7.7	-
WILL DO IN FUTURE	45.0	45.0	35.0	-	19.2	46.2	42.3	-
NOT SURE	45.0	30.0	50.0	-	30.8	19.2	11.5	-
WILL NOT DO IN FUTURE	5.0	15.0	15.0	-	42.3	26.9	38.5	-
POINT OUT THE ENERGY SAVING FEATURES OF THE HOUSE YOU BUILD...								
NOW DO SO	35.0	25.0	35.0	-	34.6	42.3	53.8	-
WILL DO IN FUTURE	30.0	55.0	30.0	-	38.5	38.5	34.6	-
NOT SURE	35.0	20.0	35.0	-	26.9	7.7	7.7	-
WILL NOT DO IN FUTURE	-	-	-	-	-	11.5	3.8	-
USE AUIDO-VISUAL MATERIALS TO COMMUNICATE ENERGY SAVING ADVANTAGES...								
NOW DO SO	5.0	10.0	-	-	3.8	-	3.8	-
WILL DO IN FUTURE	15.0	20.0	15.0	-	3.8	15.4	15.4	-
NOT SURE	55.0	40.0	55.0	-	38.5	15.4	15.4	-
WILL NOT DO IN FUTURE	25.0	30.0	30.0	-	53.8	69.2	65.4	-

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RANJIT K. BANERJI

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THE DEVELOPMENT OF AN ENERGY RELATED CURRICULUM FOR REAL ESTATE PROFESSIONALS

Hans R. Isakson

ABSTRACT

The competition for energy has made its allocation to users a major part of the energy "problem". Among possible solutions are (1) dictation by an authoritarian body or (2) direction from free-markets. The free-market solution can only function as certain market imperfections are removed. Basic to the removal of imperfections is relevant adequate energy information to the consumer.

The flow of information is through education. Energy education must play a major role in any energy policy. Currently, the most relevant information for consumers is (1) future prices and availability of energy and (2) economic feasibility of various energy saving methods. Often institutional barriers distort or inhibit sources of information.

Energy education is not cheap nor can it be achieved in even a relatively short time. An alternative, less costly and faster means of education may be realized by use of dissemination of information through professional groups and organizations. A curriculum project involving the real estate professional is described

The Development of an Energy Related Curriculum for Real Estate Professionals

By

Hans R. Isakson

Energy is a scarce resource. And, like any other scrace resource, it must be allocated, somehow, among competing users. Various means exist for accomplishing this task. One possibility is for an authoritive body to dictate how and by whom energy is used. In this approach, political mechanisms allocate scarce resources, generally in accordance with some abstract criteria, such as need. Another means is to allow a free-market to direct how and by whom energy is used. In this approach, the price mechanism allocates scarce resources; the approach is driven by greed and self-satisfaction, or as economists euphemistically call these forces, the profit motive and the maximization of household utility.

The Allocation of Energy

Free-market systems tend to be associated with non-Communistic countries, including the United States. Therefore, the free-market means of allocating scarce resources deserves more attention, particularly when applied to the allocation of energy.

Businessmen in this country literally worship the free-market system. They chant "lassez faire" and "caveat emptor" as they praise the efficiency of perfect competition.

The Model of Perfect Competition

and, there can be no doubt whatsoever, that they have something to preach about. In competitive markets the free-market price mechanism automatically allocates scarce resources to their most productive use. The results include least-cost production and something known as Pareto optimality. This is, not reallocation of resources that makes one person better-off is possible without making at least one other person worse-off. This is what "free-marketers" worship; they idolize the economic efficiency of perfect competition.

However efficient competition may be, achieving it is very difficult, particularly in energy markets. The conditions for perfect competition are many. Firms must not be capable of altering the price of their products by changing their rate of production. The industry must display freedom of entry for new firms and exit of old firms. The firm must be a price taker. That is, every firm is assumed to have a firm elasticity of demand so high that it ignores the influence that any change in its output might have upon market price. This assumption is generally considered satisfied if (1) there is a very large number of sellers, no one of whom commands a large share of the total market; (2) the products of different sellers are identical, and buyers have no preference among sellers; (3) there are so many buyers that sellers and buyers do not establish personal relationships with one another; and (4) buyers are perfectly informed about the prices and products of different sellers.

The above conditions plus the assumptions that (1) firms attempt to maximize their profits, (2) all opportunity costs are reflected in the firms costs, and (3) households maximize utility or satisfaction derived from consumption constitute the model of perfect competition.[1]

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[1] Paul A. Samuelson, Foundations of Economic Analysis (New York: Harvard University Press, 1965), pp. 78-83.

Market Imperfections

If any of the above conditions and assumptions do not hold true, then a market imperfection is said to exist. The profit motive is often strong enough to insure that most of the conditions for perfect competition are realized at least in the long-run. Furthermore, it is generally agreed that each condition need not hold perfectly true. As long as the conditions for competition are closely approximated, the model represents an acceptable paradigm of the free-market system.[2]

In the energy industry most markets contain some elements of competition and a significant amount of government regulation. Proponents of free-enterprise often argue that these government regulations act as artifical market imperfections. They imply that if the regulations were removed, then the energy industry would be perfectly competitive. For example, they claim that if the price controls on natural gas were removed, then as its price rises, new gas wells would be drilled, thereby increasing supplies and eventually lowering price. Meanwhile, consumers would cut back on their consumption of natural gas through various conservation techniques.

An Evaluation of the Response of the Energy Industry to Rising Prices

At first glance the novice might conclude that because the energy industry is so regulated, that the only way to test out this notion is to deregulate it. But in Texas, the natural gas industry is already deregulated for gas produced and consumed within the state. Indeed, it has never been regulated there nor in any other gas producing state.

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[2] James M. Henderson and Richard E. Quandt, Microeconomic Theory (New York: McGraw-Hill Book Company, 1971), pp. 103-127.

It is only when natural gas crosses state boundaries that it becomes subject to Federal Power Commission price controls.

Since 1973 the average wellhead price of old and new natural gas in Texas has jumped 600% to about $1 per 1000 cubic feet (MCF); newly discovered gas rose from 22¢ to a peak of $2.25 last winter before falling back to $1.80 more recently. A major Texas gas company reported a 400% increase in their profits during the last four months of 1976. The model of perfect competition predicts that these profits will encourage an increase in gas production. But, since 1973 gas production in Texas has steadfastly declined by an average of about 500 million cubic feet per year.

Naturally, industry spokesmen claim that the decline has occurred because the larger interstate markets are still regulated. If natural gas prices are deregulated and production still does not respond, then perhaps these same spokesmen will site the larger, and still regulated, international markets as the culprits. Even if their claims have merit, they are inconsistent with the lack of a noteworthy drop in intrastate prices following last winter's windfall profits. A closer examination of those 400% profits will probably be used to finance executive bonuses, employee pay raises, new office buildings, and the like. During the last four months of 1977 expenditures on the exploration for and the development of new natural gas in Texas actually declined while expenditures on personnel, supplies and office equipment increased substantially.

Furhtermore, evidence of consumer conservation efforts is very weak. Before 1973 natural gas in Texas was used in highly inefficient ways because it was so plentiful and so inexpensive. Millions of homes were built with virtually no insulation. Natural gas powered air conditioning units were not at all uncommon. But, Texans have not responded to their high gas prices with the sort of energy conservation implied by the model of perfect competition.

Thus, at least in the intrastate natural gas area, the free-market has failed to achieve anything that even remotely resembles perfect competition. There appears to be two key reasons for this market failure. First, individual producers preceived an elasticity of demand that is not high enough for them to ignore the influence that changes in their output have upon price. Or, more specifically, consumers lack perfect information about the prices and products they consume. Second, certain institutional barriers exist that inhibit the free flow of information and constrain the ability of the free-market to respond competitively.

Thus, it appears that energy is being allocated inefficiently. Government regulations interfere with the ability of relative prices to reflect scarcity. But, the lack of perfect (or nearly perfect) information concerning the prices and products buyers consume and the presence of certain institutional barriers suggest that the removal of the government regulations will not result in an efficient allocation of resources, at least not in the short-run.

Information and Institutional Barriers

A number of kinds of information are needed before the U.S. economy can achieve anything near an efficient allocation of energy. First, the nation needs more information regarding the efficiency with which energy is used. Furthermore, the proper measure of efficiency should be based on the second, rather than the first, law of thermodynamics. Efficiency calculations based upon the first law amount to nothing more than the ratio of useful output-

Table 1

Efficiency Factors for Common Activities Based Upon the Second Law of Thermo-dynamics

Activity	Efficiency
Steel Production	23%
Aluminum Production	13
Cement Making	10
Petroleum Refining	9
Oil or Gas Heating	5
Air Conditioning	4.5
Regrigeration	4
Gas Hot Water Heating	3
Electric Resistant Heating	2.5
Elecrtic Hot Water Heating	1.5
Papermaking	0-1

Source: Marc H. Ross and Robert H. Williams, Center for Environmental Studies, Princeton University and Technical Aspects of Efficient Energy Utilization," American Physical Society, 1974 to-input energy. It often over states the efficiency of a device relative to other devices. The second law describes entropy, the gradual, inexorable death of the universe. It says that any task should be matched as closely as possible with an appropriate form of available work; otherwise demise is hastened. Gauging efficiency by the second law compares the relative merits of alternative devices.

For example, the home heating furnace (oil or gas) industry typically claims an efficiency factor of 60%, meaning that 60% of the energy in the fuel is delivered to the house and 40% escapes as waste, usually up the chimney. But, in terms of the second law the efficiency of home heating furnaces is only 5% because a heat pump can deliver as heat to the home more then 100% of the energy it consumes.

Table 1 lists the second law efficiencies of several representative activities. From these figures it is clear that a great potential exists for energy savings in building.

But, in order to achieve these improvement certain costs will be encountered. The second piece of information vital to the free-enterprise system is the cost of achieving an increase in the efficiency of an energy consuming activity. In this area information is very limited. Table 2 lists some cost figures for several possible sources of energy, including energy saving capital investments. Although these figures represent "rough and dirty" estimates, they clearly demonstrate the advantages of energy conservation. With the world price of oil at $11 or more per barrel, why are investments in energy saving devices, which can produce the equivalent of a barrel of oil (or more) for $1.50, not being made? The answer is that the lack of adequate information, such as that above, and the institutional barriers inhibit these investments.

Table 2

Investment Costs of Energy

Source	Cost (Billions/Quad)
New oil or gas well (except Mid-East)	4.5
Synthetic oil and gas	10 or more
New electric power plants (coal)	45
New electric power plants (nuclear)	90
Energy Saving Capital	1.5
Burning Coal	2
Elimination of wasteful operating practices	0

Source: Business Week, April 25, 1977, pp. 69-71

The Institutional Barriers

A number of institutional barriers to energy conserving investments flow from the lack of adequate product information. In housing, most energy saving features are hidden within the walls, floors, and ceiling of the structure. For this reason, they are difficult to sell and to finance. A pair of homes sitting side-by-side would look identical to the average home buyer even though one might be twice as energy efficient as the other. Because the energy efficient home probably costs more, many home buyers would rather purchase the cheaper home, even after being shown that their utility bill savings would more than offset their mortgage payments on the energy efficient house. Thus, builders are reluctant to build, and lenders are hesitant to finance, energy efficient homes. Also, for the same reasons, real estate brokers fail to collect energy efficient information on the homes they list, and real estate appraisers rarely master lify-cycle costing procedures.

Another institutional barrier is the tendancy of existing utility rate structures to disguise the actual value (in life-cycle cost terms) of energy saving investments. The use of average cost, rather than marginal cost, pricing and rate-of-return regulations have the effect of converting $50 not invested in household energy saving equipment (i.e., a more efficient air conditioner) into an investment in generating plant and equipment of some $200. Naturally, public utility companies prefer larger to smaller plants.

Yet another institutional barrier is the demand by industry for a higher rate of return on discretionary investments in ancillary projects than on investments in their product lines. The latter investments provide an opportunity to the individual firm of increasing its share of the market, the former offers only a chance to reduce operating costs. Lenders reinforce the negative effects of industry's behavior by preferring direct business venture loans, to loans that finance operating cost reduction.

The discussion so far clearly demonstrates an important feature of the energy problem, namely that it is multidisciplinary. It involves and touches upon many area of specialization. But, our academic and business institutionas emphasize disciplinary studies and professional specialization. Such emphasis inhibits engineers from communicating with economists. It has created a barrier between architects and real estate appraisers. Unless these barriers are torn down, the major problem solving capacity of our nation will be unable to resolve the energy crisis.

The last, and perhaps the most potent, institutional barrier is the post-spunik romance of Americans with the notion that new scientific breakthrough will solve all of our problems. This attitude has been fostered by a strong emphasis upon the physical sciences and mathematics in the educational programs of the 1960's and 1970's. It is also responsible for a lack of emphasis upon economics. The total effect is an unhealthy reliance upon "good old Yankee ingenuity and technical know-how." It is true that our scientific community did get an American to the moon before any other earthling. But, we cannot rely upon technological breakthroughs to solve the energy crisis.

All of these institutional barriers can be over come given adequate energy information. The flow of information is through education. Thus, energy education must play a major role in any meaningful, rational energy policy.

A Rationale for Government Action

Let us presume that our society desires less rather than more government regulation, provided that market imperfections do not systematically interfere with the price mechanism's role of efficiently allocating energy. Then, two simultaneous government actions are warranted. First and foremost, the government sector must improve the availability of relevant energy information to consumers. Secondly, the government must gradually deregulate the energy industry with vigilance toward its organization. As the perfect information condition comes closer to being realized, the energy industry should be regulated less and less, while the other conditions for competition are carefully monitored.

The Need for Relevant Energy Information

Consumers often disply myopic tendencies in their purchasing decisions. This behavior is particularly evident in the consumption of energy. Man rarely consumes energy directly. Instead, he builds machines that consume energy which assist him in doing work. Nobody ingests gasoline, instead we feed it to automobiles to get us from here to there. Furthermore, all machines share a most annoying characteristic. The rate at which they convert energy into work varies directly with their opportunity costs, holding technology constant. Automobiles that deliver better gas mileage without sacrificing horsepower generally cost more than comparable cars. Thus, while energy prices are rising, particularly after a long period of stability, consumers are reluctant to pay more for more efficient machines partly because they erroneously extrapolate yesterday's low energy prices into the future, and partly because they underestimate the present value of future energy savings.

The model of perfect competition predicts if society were prefectly and fully aware of the effects of rising energy prices and the value of energy saving techniques, devices, and materials, that they would voluntarily undertake energy conserving investments. The lack of this information leads to a market failure. That is, without this information, society will consist of (1) future prices (and availability) of energy and (2) the economic feasibility of various energy saving methods.

Energy Education

Educational efforts aimed at society in general are costly to undertake. Furthermore, these efforts may take decades to achieve the desired results. Therefore, an alternative, less costly, and faster means of education is needed. One possible approach builds upon diffusion theory.[3] That is, the notion that information dissemination occurs through certain "gatekeepers" or opinion leaders within a professional group or organization. These gatekeepers act as information seekers and evaluators for the group. They seek out new ideas and innovations which they asses; weeding out those ideas and innovations that are irrelevant to the group.

The difficulty with this approach is that consumers, the primary target group, are not at all well organized. Two options that avoid this difficulty are (1) to organize consumers into cooperatives that could perform the gatekeeper functions, or (2) to reach consumers through the industries that supply them goods and services. Again, the first option is costly and time consuming; the second has great potential, particularly in those industries where information delivery vehicles already exist.

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[3] Thomas S. Robertson, Innovative Behavior and Communication, (New York: Holt, Rinehart and Winston, Inc., 1971), pp. 254-266.

Education of the Real Estate Professional

The real estate industry is favorably organized, and adeptly equipped with efficient information delivery vehicles. Real Estate lenders are neatly dividable into mutually exclusive categories. There are savings and loan associations, mutual savings banks, mortgage banks, commercial banks, life insurance companies, and public (and quasi-public) agencies. Each of these lender groups have one or more trade associations that can be instrumental in the dissemination of relevant energy information to them. Real estate appraisers are also represented by a number of trade associations that are very active in educating their members. Realtors have their National Association of Realtors which is very active in the educational area. Builders have many trade associations to select from, and some builders often belong to more than one.

Furthermore, each professional trade association has state and local chapters as well as a national headquarters. Nearly all of them have some type of education committee. Very frequently, the officers and committee members of these organizations are opinion leaders within their area of specialization.

Thus, a successful educational effort aimed at real estate professionals would enlist the support of the professional trade associations. Relevant energy information transmitted to the gatekeepers through existing trade association delivery vehicles should reach nearly all real estate professionals in a very short period of time. Heightened energy awareness among real estate professional would insure the availability of more thorough energy information in the real estate decision making process. Because consumers are involved in this process as much as the real estate professional, the education of the latter will improve the decisions of the former.

Types of Energy Information Relevant to Real Estate Professionals

Real estate professionals have a need for several types of energy information. First, they need a general understanding of energy industries, including the organization of extraction industries and the electrical generation industry. They need insight into how fuel prices are determined and how federal energy legislation will effect these prices. Also, they require a broad comprehension of the energy characteristics of real estate.

They lack information regarding specific energy saving products and techniques, and market reactions to these products and techniques. They need special analytical tools that can determine the economic feasibility of energy saving investments, and simplified rules-of-thumb that can streamline their decision making procedures. In short, they need to be shown why and how to incorporate energy factors into their business routines.[4]

A Model of Curriculum Development

An energy curriculum for real estate professionals is currently being developed at the University of Georgia in accordance with the model shown in Figure 1. Commitments were received from major trade associations to adopt this curriculum, or parts of it, as standard course to be offered to their members. All of these trade associations were about to develop their own energy related instructional materials in an ad hoc manner. Because they all share common interests, it was logical for them to pool these interests in order to produce one carefully pre-pared curriculum rather than serveral hastily pollulated courses. The Federal Energy Administration (now the Department of Energy) is funding this project.

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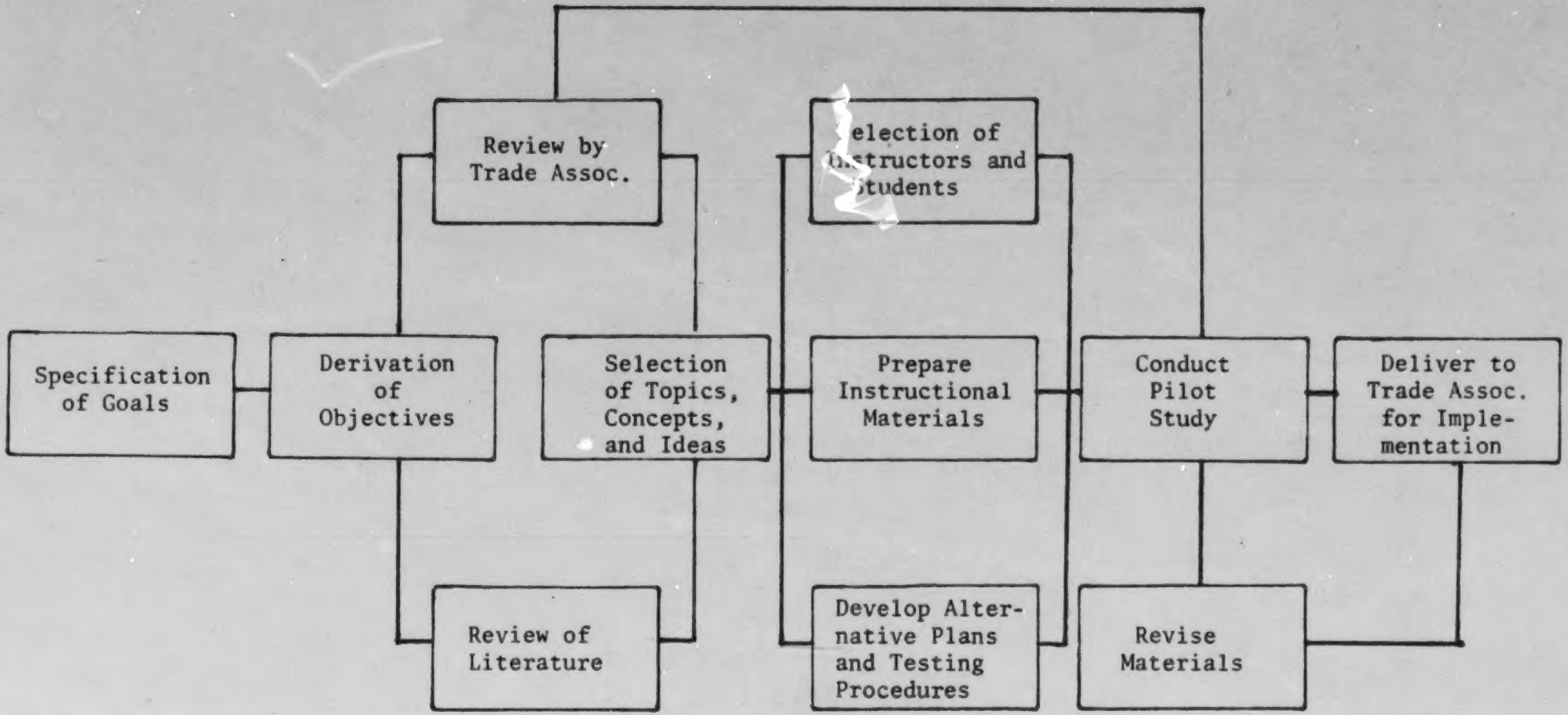
[4] Hans R. Isakson and Richard L. Haney, Jr., "Lender Impacts Upon Energy Conservation in Buildings," (FEA/D-77/125, February 1977), pp. 119-133.

Figure 1

Model of Curriculum Development


Review by Trade Assoc.
Selection of Instructors and Students
Specification of Goals
Derivation of Objectives
Selection of Topics, Concepts, and Ideas
Prepare Instructional Materials
Conduct Pilot Study
Deliver to Trade Assoc. for Implementation
Review of Literature
Develop Alternative Plans and Testing Procedures
Revise Materials

The Major Goals

The curriculum is being developed to satisfy two major goals. First, it must build the confidence, assurance, and poise of the students with regards to energy matters in general, and energy effects on real estate in particular. The students must have a basic understanding of the energy sector so that they can be comfortable with what is to follow. Secondly, the curriculum must develop competence in the students so that they can proficiently perform the analytical evaluations needed to incorporate energy factors into their business routines.

The intent of these goals is to provide the students the tools they need, and to show them how these tools can be used to improve their way of doing business. The curriculum will include applications of these tools to actual energy saving methods, but it will not dictate "pat" answers to the energy crisis. Instead, it will strive to provide the students the ability to calculate the best answers for their own particular market area. This approach also enables the students to adjust to changing conditions and to evaluate new conserving devices not discussed in the curriculum.

The Curriculum Objectives

The objectives of the curriculum are structured to achieve the above goals. Three objectives have been derived from each goal. In an effort to achieve the first goal, and to stimulate the interest and the responsiveness of the students, the first objective is to familarize the students with existing and pending energy legislation. In previous research it was found that real estate professionals acquire a very positive attitude about energy matters after they learn about the strigent sanctions and coercive controls contained in existing energy legislation.[5] By presenting this material first, the students should be more receptive to what follows.

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[5] *Ibid.*, pp.

Next, the student will be given a broad overview of various energy industries, including their history, present status, and future. The third objective is to acquaint the students with the energy characteristics of real estate, including both the physical and the environmental features of importance.

The next three objectives are intended to build competence. They concentrate upon (1) the mechanics of various energy saving methods (2) energy economics, and (3) professional guidelines and aids in energy conservation. The mechanics of energy saving methods will proceed from the simple to the complex, with envelope factors treated spearately from HVAC systems at first, and later together. Energy audits will also be covered here.

In the energy economics section of the curriculum the students will be shown how energy prices are determined, and how they can more accurately predict fuel and electricity prices in their own market areas. Also, this section will feature the analytical tools the students need in order to evaluate energy saving investment. Life-cycle costing, payback periods, and rate-of-return analysis are a few of the tools to be taught. Each tool will be applied to one or more of the energy saving methods described earlier. Thus, the students will have seen these methods at least twice, thereby increasing their ability to understand them. Finally, this section will provide the students with a financial analysis of solar energy systems and actual case studies of solar installations.

The last objective of the curriculum is to inform the students about certain guidelines and aids that would prove useful to them if they should desire (and hopefully they will) to incorporate energy conservation into their business routines. The forms the real estate professional uses will be examined for energy content, and how to build in energy information even when no room is supplied for it. Loan evaluation procedures that highlight energy will be presented along with energy conscious appraisal and marketing techniques. Some of these topics may prove to be too specialized for all real estate professional, so they will be structured into easily deletable lessons.

The Instructional Devices

The final curriculum package will consist of a textbook, student workbook, instructor's manual, and related audio-visual aids. A thorough review of the literature and interaction with the cooperating trade associations constitute the strategies used to select the actual topics, concepts, and ideas to include in the curriculum. These substantive topics will be ranked according to their degree of difficulty and ease of presentation. Those that are more difficult will be covered in the textbook and workbook exercises. The more easily understandable topics will be presented in the workbook as case studies for reading outside the classroom.

The main instructional devices will consist of visual and audio presentations, reinforced by in-class and out-of-class exercises. The introduction of a new idea or concept will be facilitated by highly descriptive overhead. Furthermore, within each objective area, the ideas and concepts will proceed from the simple to the more complex. General overviews will be followed by detailed instruction with topical summaries at the end of each section.

Important energy saving techniques and devices will be covered more than once. They will be introduced briefly in the section on the energy characteristics of real estate, then presented in detail in the section on various energy saving methods, and finally examined for economic feasibility in the energy economics section. The repetition provided by this approach should reinforce the students' confidence and competence in dealing with energy conservation.

As the instructional materials are being prepared, instructors will be randomly selected from lists of qualified teachers supplied by the trade associations. Representative students will be chosen in a similar manner.

Also, a number of lesson packages will be generated from the curriculum. A total of 25 one-hour lessons will be produced, but no more than 21 of these would ever be used in the same course because six of the lessons will be designed to meet the special needs of the various specializations within the real estate industry. Thus, the full curriculum will consist of 21 hours of instruction. But, some groups may not wish to present the full curriculum to their members. Therefore, shorter, six to eight hour courses will be created by carefully combining some of the 21 lessons. The lesson plans will be developed such that some of them can be fitted together into shorter courses. However, such combinations will sacrifice some, but not all, of the objectives mentioned earlier.

Testing Procedures

Finally, pre- and post-tests will be developed for administration during a pilot presentation of the curriculum. The tests will be designed to measure the degree to which the curriculum achieves its objectives. Also, an independent evaluator will conduct in-depth personal interviews with randomly selected students about one week after the completion of the pilot presentation. The curriculum will be refined where necessary as a result of these tests and interviews.

Delivery to Trade Associations

The last step is to deliver the curriculum with implementation instructions to the cooperating trade associations. As stated earlier, these trade associations have already committed themselves to offer this course through their existing educational delivery vehicles. The curriculum will have been designed for delivery by trade association instructors, and its contents will have been structured to achieve goals that will facilitate the diffusion of relevant energy information into the real estate decision making process.

Summary

It is argued that a free-market solution to the energy crisis will approximate the results of perfect competition only if certain market imprefections are removed first. The key source of market failure is identified as the lack of relevant energy information on the part of consumers. It is then suggested that rational government actions should include (1) energy education and (2) energy industry deregulation.

Because the education of consumers is costly and timely, it is suggested that the gatekeepers of professional organizations, which represent industries that deal directly with the energy consumer, be educated with respect to relevant energy matters. The real estate industry is offered as a target group.

Finally, a curriculum model is presented that can achieve the desired results. That is, a model is offered for the development of an energy course that will enable the real estate professional to incorporate, confidently and competently, relevant energy factors into the real estate decision making process. Because the consumer plays an active role in this process, the results will be as if the cosumer were educated directly.

HANS R. ISAKSON

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Dr. Isakson has authored several articles and government reports dealing with the impact of energy upon real estate markets and institutions, including "Lender Impacts Upon Energy Conservation in Buildings." He consults both government and industry and directed the recent "Energy Conservation in Buildings" national survey of real estate lenders and appraisers. Also, he has authored several economic impact studies and several papers dealing with structure of metropolitan governments.

Currently, he is directing the development of an energy curriculum for real estate professionals under the auspices of the new Department of Energy, Washington, D.C.

EDUCATION OF ARCHITECTS FOR ENERGY CONSERVATION

Jeffrey Cook

ABSTRACT

Although historically, architects designed only major buildings and were not involved in houses for the masses or commercial sturctures, today in the U.S., architects are responsible for more buildings than at any time or place in history.

Practicing architects are now in the forefront with opportunities for energy conservation leadership and responsibility.

However, energy understanding does not come quickly or easily. It is experiential - and since the Renaissance days of Alberti, architecture has gotten farther and farther away from the job site, less and less a field-oriented learning milieu and more and more a cloistered profession.

The education of architects has followed in a similar vein. Though, still, a selective profession - the selection has seen a change in necessary competencies. Today the core of the architectural curriculum is design.

The issue of Energy in Design may be a problem to schools of architecture. Instead of being a separated - and potentially isolated - subject, energy needs integration into all course definitions. The greatest challenge is to reduce the time required to achieve energy understanding at the level of the professional degree.

EDUCATION OF ARCHITECTS FOR ENERGY CONSERVATION

by

Jeffrey Cook

Architects

Today, architects are those professionals, skilled in the arts and sciences of buildings, who are usually responsible for the design and construction definition of major buildings. Architects have never been involved in all building. In fact, historically, architects designed only the most important of buildings. Historically, architects were never involved in the design of housing for the masses, nor in sturctures of commerce, industry, and education. Yet probably, in the United States today, architects are responsible for more building than at any other time or place in history. Architects are in a unique position of leadership and responsibility.

Among those typical building programs in which architects do not practice leadership roles today are:

1.) heavy construction--roads and freeways
utilities and public services
extractive and basic industry

2.) speculative and tract: housing
business and production sturctures (so called package buildings)

Thus, although "Architecture" with a capital "A" is usually thought of as refined monumental building as represented historically by churches, temples, and palaces; and today by banks, corporate headquarters, and city halls; architects are involved and responsible for a much broader production of building. Indeed, one could sarcastically observe that Architects today are too seldom involved in the production of Architecture. Their usual bread and butter is just buildings; functional and attractive. But, timeless and memorable--rarely.

In addition architects exercise other leadership roles: from aesthetical tastemaker and trend setter to environmental champion and social reformer. The professional skills of synthesizing solutions from indeterminate problems and of directing nonlinear and divergent situations are highly valuable abilities outside the profession.

Art and Science

An important dichotomy of these definitions of "Architect" and Architectural" skill is that they involve both Art and Science. It is not an either/or proposition. As a result, elementary assumptions that architects must be artist, or alternatively, good in applied mathematics, miss the mark by more than 50%. Inevitably, in the exploding information holocaust of the late 20th century, the ever expanding horizon of technical facts about all the ramifications of building is well beyond the grasp of the most astute and conscientious professional. Architects have always had to be prepared to take intuitive leaps. But, alternatively, attempts at designing artistic structures for human use without some of this knowledge, have resulted in scenic conclusions that at best must be regarded as occupiable sculpture. Thus, there is no art without science.

The Science of Structure

The debate about art and science in architecture has raged for a long time. Even structural realities as they are understood today were not, and are not, necessarily concluded and resolved in a purely mechanical and statistical determination. In as structural and historical architecture as the Gothic cathedral, the concern for technical refinement was, in fact arrived at by an artistically exploratory method; not an empirical calculation based on load/size proportioning. The methods of late Gothic architects are well documented in the written reports of the building committee for the Cathedral at Milan:

> "...Our clearest insight into Gothic solutions to structural problems is provided by the controversy that arose in 1386 at the Cathedral of Milan. The Milanese had begun an enormous church that seems shortly to have gotten out of hand. In their unfamiliarity with building on such a scale and in such a style, they were uncertain how big to make the piers or what form to give them. But most important of all, they could not decide how tall the piers, aisles, and vaults of the nave should be. They called upon experienced masters from France and Germany to aid them, and the visiting foreigners attempted to answer their questions by proposing that the shape of the nave should be determined by a simple geometrical figure. But each proposed a different one--an equilateral triangle, a series of squares, of rectangles, and a combination of these. The decision, which lasted (15 years) until 1401 brings into focus the principles of design employed north of the Alps in the fourteenth century. Proportion (as an aesthetic consideration) was almost an incidental question; what mattered was the over-all, abstract scheme or figure of the edifice, which the northerners called the "science" of building and which they thought helped to solve problems of stability. The fact that each master proposed a different solution indicates that these were not based on accurate statical considerations but were merely rules-of-thumb found to have been successful by generation of builders..." (Gothic Architecture, Robert Branner, 1961, pp. 19-20).

One could argue that the principles of the conservation of energy as well as the sublimation of human aspirations in a design of spiritual content could find no better demonstration than in the ribbed vaults and pointed arches of Gothic construction. But, these results were the responsibility of neither clergy nor engineers, and certainly not of the building committee of politicians. It was architects who master planned and supervised the construction from the excavation through the scaffolding to the dedication of both those Gothic monuments that stood, as well as those that collapsed.

Surely, one proof that the field of architects is neither an art or a science is the dearth of financial aid or access to the Federal purse for architectural schools. There are very few programs of either the National Science Foundation or the National Endowment for the Humanities to which architecture education can turn!

Traditional Architectural Education

Throughout the ancient world and up to the European Renaissance, architectural education was a product of apprenticeship. It was typically based on the most prevalent construction craft--often stone masonry. Thus, every initiate began by working with his hands in the media of building. Obviously, the rise of an exceptional novice beyond the responsibility and expectations of a journeyman, and even master, was a highly select process based on a screening that involved more than technical competence. Qualification to become the designer was on comparative merit. Total performance in the field counted for everything. Constant practice provided continuing education and updating.

The Greatest

Probably the most successful architect of all time was the first architect whose name we know. Imhotep was the Egyptian architect of 5,000 years ago credited with popularizing the use of cut stone for the construction of whole buildings. He is also credited with inventing the pyramid; two professional accomplishments that have been very difficult to match.

Imhotep's legendary success could also be measured by his recognition during and after his own lifetime. He ultimately became deified and the center of religous veneration. Imhotep was later worshipped by the Greeks under the name Askiepois. For the Egyptians his memory was also as a mathematician, a physician, and an inventor in construction. He was honored (by the hundreds of thousands), mummified birds and animals sacred to his name.

Even within the temple enclosure of his greatest building, the Stepped Pyramid of King Zoser at Saqqara, there still exists an inscribed pedestal in the ceremonial court.

> "'Chancellor of the king of Lower Egypt, First after the King of Upper Egypt, Administrator of the great Palace, Heredtary Nobleman, High Priest of Heliopolis, Builder, Sculptor and Maker of Vases in Chief'. Imhotep certainly was not a royal prince. A later inscription states that his father, Ka-nefer, was Director of Works of Upper and Lower Egypt, providing us with the interesting information that, even in ancient Egypt, technology was administered by a professional meritocracy". (The Riddle of the Pyramids, Kurt Mendelssohn, p. 35.)

Yet, Imhotep's leadership extended beyond the artistic and mechanical. He became the synthesizer of priest and politician. He launched the pharonic Age of Pyramids which has only recently been regarded in its extravagant channeling of resources as a deliberate national building program. By establishing a vast efficient and complex civil service, the uncommitted energies of tens of thousands of parochial villagers during the three months of annual floods, were focused into a series of lasting monuments that fused a deliberate consciousness of nationhood. Imhotep was responsible for the escalation of a program from tomb building, whose purpose was to safely house a corpse, to the construction of national monuments whose object was a new social order. This revolutionary building program lasted only a couple of centuries and produced objects which must fundamentally be considered useless.

There are surely some object lessons in the career success of architect Imhotep. Ever since, architects have been handmaidens of priests and politicians. The energy lessons of a pyramid program may be no more challenging to ponder. But, our conclusions may not be so acceptable; the fostering of national ethics appears to be more complex today. After the Age of Pyramids, Egypt persisted as a major country for another 2,500 years.

Education of the Modern Architect

The pattern of education and professional practice of the modern architect were outlined by the middle of the 15th century by that learned Florentine architect and know-it-all, Leon Batista Alberti. In his age, it was possible to be a Renaissance Man and to have a comprehensive understanding of the known world of knowledge. Alberti redirected professional preparation from manual apprenticeship to academic learning. It is no coincidence that the printed book was the new information medium that precipitated a new professional qualification.

Since Alberti, the ideal architect is expected to be a gentleman scholar with clean finger nails. The process of the design of buildings has become an isolated abstract study, often remote from the realities of materials, site, or client/user. The initiation of the beginning architect into the rudiments of his calling is not on the dusty, rickety scaffolding of construction staging, but bent over a drafting board in a university temple of space. Buildings are now the product of sharp pencils or felt tip pens on expanses of paper, not the result of intimate tactile experience with the world of materials and the physical realities of nature. The particulars of the profession are no longer the secret subject for select novices communicated in the privacy and ritual of the mason's guild lodge. Now, they are the words of critical judgment in the design jury--Olympian pronouncements over abstract drawings of some academic exercise, whose first assumption is that it will not be built.

Architectural education has become a cloistered and air conditioned prelude to the profession. Probably the expanding encyclopedic information about the physical world which was initiated by the explorations--scientific and goegraphic--of the European Renaissance, can be accommodated in no other way. But the hermetic isolation of architectural students from both the smalls of the construction site and the scent of the practicing office, is sometimes a denial of reality that cannot be bridged by the newly graduated.

Selection to the Profession

Admission to an architectrual curriculum has always been selective. The apprentice mason might go no further than hod carrier. And while competence in the craft was the historical discriminating issue; today, it is academic excellence which provides the entrance screen. In both cases, the masters set the standards. In both cases, it is a self-perpetuating and self-fulfilling process. Those are admitted who are expected to perform within the given educational structure. Conversely, the educational structure is stabilized by its confirmation from competitive students selected to fit. But in the modern system, the skills and aptitudes most desired for professional success are ignored in favor of assuring academic success. Thus, shifts in professional needs, such as the energy issue, may not be reflected in academic interests, such as computer space simulation, may not have any reflection in professional practice, although they may get considerable academic attention.

Curriculum

Since the Renaissance, the core of any architectural curriculum has been Design. Although this term is assumed to refer to the process of the design of buildings, in fact, it is a much more aesthetic discipline involving monastic comtemplation, rigorous self-denial, and intense dedication. Long hours are the rule. On university campuses, the architecture building is the only one used continuously 24 hours a day. Architecture students will riot if not allowed to work through night and day.

Design by these means is learned, but seldom taught. It happens in a studio environment with very low student/faculty ratios. It is typically a one-to-one, tutorial exchange of values through student trial designs that serve as the basis of extemporaneous, but intense dialogue.

In the curriculum, Design is regarded as a discipline of academic synthesis in which all the inputs from a structured selection of specialized course offerings are creatively focused in the resolution of a series of case studies. Hypothetical designs are communicated graphically in a series of drawings and sometimes models, as well as verbally. But the definition of materials, whether surfaces or constructional cross sections, is seldom expected or appreciated. Verification by mathematical calculation, or controlled simulation, is totally absent except in confirming required floor areas or volumes. Validation of design is typically pronounced on visual criteria. Thus, it is the only satisfactory aesthetic appearance of surfaces and spaces that counts.

Energy in Design

Since energy is an invisible but dynamic quality of achieving building comfort and completing work processes, it is an elusive criterion in present instruction; thus, it is assumed to have no legitimacy. Since it cannot be seen, it is typically avoided as an issue. Its inclusion is always at the discretion of the design instructor whose judgment and autonomy are seldom questioned.

The secondary aspects of energy in building, whether in the choice and performance of construction materials, or mechanical equipment, are not compatible with present design instruction--a practice confirmed by a tradition of architectrual education that goes back 500 years.

Solar Design

It is, perhaps, both prophetic and pathetic that within the past year or so, virtually every architectural school in the country and almost everywhere else, have included the design of solar houses as one of their design exercise subjects. In part, this phenomena is a result of two competitions organized by the A.I.A. Research Programs and sponsored, or promoted by Federal educational programs. But, in part, these academic exercises have been a response to world energy awareness and yet another search for exciting architectrual form. For the past generation, architectural students and practicing architects have been susceptible to new programmatic determinates that might provide distinctive architectonic expression.

It is elementary that solar buildings must expose themselves--their solar part must hang out. But, spatially, solar is less productive as an aesthetic generator. Those elements of energy storage, control, and delivery which are typical parts of all 20th century buildings are even less visually stimulating than the fuel tanks, boilers, blowers, ducts, and grilles of fossil fueled buildings; although solar is potentially more romantically disposed. Thus, the infatuation with solar houses will probably soon pass--as it should, if there is little aesthetic stimulus on the one hand, little validation on the other, and an absense of ethic for a third.

Alternatively, solar energy design may be the key to getting energy into the design studio. The sun is universal. Anywhere man wants to live some sun shines. The sun can be central to any factual, or philosophical consideration of energy as a human problem in building. Thus, the sun offers both a visual key in design criterion, as well as a comprehensive ethic that has cosmic origins, and significance of solar energy is the most likely standard in transforming the design of buildings to an attitude of energy sensitivity and to an integrity and meaning based on responsible performance.

Energy Qualification

Other energy sources than solar find little room in the design studio even though all professional curricular for architects include courses in building comfort systems and in building consturction technology. The academic instructors in mechanical equipment and materials specification suffer continual inferiority complexes because of the eclipse of their area of expertise by Design.

New Curricula

It is revealing that in the last years, in response much more to student pressures and faculty preference than to professional need, that many architectural schools have revised their curricular. In general, they have provided a new, much more general, undergraduate degree program; identified by such terms as Bachelor of Environmental Design (BED), or Bachelor of Science in Architecture (BSA), or even a Bachelor of Architecture (BArch), which is not accredited, and might be regarded as a soft degree. In all cases, entrance to the program is not rigorous and continuation of studies without great effort is usual. There are many curriculum choices and there is little core structuring of compulsory courses.

Predictably, such curricula include design studio, although subject matter and exercise conclusions are not always buildings. Concerning other courses in such a generalized undergraduate curriculum, there are broad offerings of introductions to many fields--but little in terms of structures sequences.

For instance, Art as an applied sequence of studio skills, or as a history of ideas, is missing. Similarly, there is a distinct absence of the sciences as a continuing discipline: Physics, structures, construction materials, specifications, and working drawings are absent. These are the quantifiable subjects that could validate energy as an issue in building design. This is also the "science" which is a pre-requisite to "art."

An Energy Curriculum

An interesting energy curriculum which is exceptional in the United States and elsewhere, is the graduate degree program in Solar Studies at Arizona State University, with which I am associated. One year of course work and thesis leads to a Master of Environmental Planning. It is a structured program of advanced courses in the applications of solar energy to the design of buildings and communities. However, since solar energy is a capital, intensive investment, the prameter of energy conservation is an integral consideration. The emergence of Passive Solar design as a Federally recognized energy field, was anticipated by the Arizona State University solar program where Sensitivity to climate and its interaction with buildings is the beginning of core curriculum.

Entrance to the program is restricted to those with a demonstrated capacity for advanced work. The solar design concentration which involves design studio work, is accessible only to those with professional architectrual degrees; preferable to those with some professional experience. Alternatively, entrance to the solar technology concentration requires a degree in engineering or physics. The premise has been that developed professional skills, as well as specific motivation, are a necessary pre-requisite to a short and intense graduate program. Thus, it is also a program that attempts to maximize the effectiveness of extremely modest resources.

The development of the advanced solar energy master's program at Arizona State University has been without any assistance of directive from the Federal government, or particular input from any state government, or even other parts of the University at large. The program was developed and supported within the College of Architecture in the belief that this was an area of great necessity in which the faculty and region could make a particular contribution. The program of approximately 25 students is taught primarily by two mechanical engineers and an architect and has been active for three years. Although a national and even international recognition has emerged from this effort, the potential effectiveness from such a small sized program could be greatly amplified by the slightest cooperation, assistance, or support from outside.

The integration of solar energy skills and understandings qualifies graduates in ways that overlap and extend the now separate professional boundaries of present day architects, engineers, and planners. At least as important as the development of what must be regarded as a set of emergent design disciplines as professional tools, is the confirmation of an energy ethic as a professional commitment.

A Second Degree

Elsewhere graduates of the sort first degree system must seek a second degree.

Armed with their first degree, a paraprofessional Bachelor of introduction degrees, select students are admitted through a much tighter screen into professional degree programs. This second degree may be a Master's of Architecture, or a Bachelor's of Architecture--although through the inflation of standards the Master's is more typical. Access is restricted, not only by academic merit, but also by course pre-requisites. Additional or remedial foundation course work, is often necessary to pursue a professional degree which may take from one to three years.

A criticism of these two-staged programs of architectural education for professional degree, is that Design--the core discipline--has now been reduced from what used to be a five or six year continuing sequence, to as little as three years. Similarly, both technical courses (structures, environmental control systems), as well as cultural values sequences (history, theory of architecture), have truncated sequences and sometimes are reduced to single courses. With concerns as complex and interactive as energy, such a curriculum reduces or eliminates opportunities for continous and accretive educational experience. Energy, as an area of importance, is unlikely to become known, much less popular, if there is not opportunity for comprehension, understanding, or involvement.

Energy in Curriculum

It should, perhaps, be suggested that, potentially, energy should not be regarded as another straw in the camel's basket; as another subject that wants a separate series of courses, professors, sequences, text books, and credits. Rather, energy is an inescapable quality of all objects and activities. Therefore, ideally, it might be represented as an articulated aspect of the content of all existing course definitions; rather than as a separated and, thus, potentially isolated other subject that must somehow shoulder its way into an already overloaded catalogue of courses.

With such a premise, the issue of Energy might become a repeated theme for quantification, not only in technical and mathematically based architectural specialization courses. Energy issues are as central to programming and management areas as to economics. But energy must also be identified as a criterion in courses concerned with cultural value systems and instruction in the world of ideas: potent, but untouched, are philosophy, architectural history, and theory. Ultimately, Design must integrate energy as a quality of worth at every level of studio instruction.

Energy Understanding and Age

Energy understanding does not come easily or quickly. It is not flattering to observe that energy is not a convincing issue with the young. Such an observation goes beyond the fact that by health and enthusiasm, the young have human energy on their side--at least temporarily. But, the college student in the professions today gained his understanding of human values, including energy realities, primarily during the 1960's when science and money promised answers to the few human problems perceivable on the American horizon. And while science and technology had a relatively strong emphasis in school systems throughout the country, their application was from a different value base than is operative today.

Another observation might confirm that it appears that older practicioners, whether practicing architects, engineers, academicians, or researchers, appear to have a much better appreciation of energy than the most enthusiastic, recently graduated architect. This could be attributed to the realiation that energy is indeed an abstract subject. The presence of energy potential is typically identified only by the dynamic effects of what is a change potential. In a world philosophically sensitive to change, energy is an all pervasive force that has content in everything.

Thus, the perception, visualization and projection of energy as an objective quantity and quality of the human experience seems best practiced by those professionals with the longest experience. Involvement and commitment through continuing education for the profession, and retreading and rejuvinating the experienced seems to be the easiest educational goal. Our most challenging educational goal is to reduce the time required to achieve energy understanding at the level of the professional degree.

Conclusions

In summary, energy in the professional education of the architect must respond to the fact that:

1.) the design of buildings is both an art and a science;
2.) although there are many definitions of science, there is no art without science;
3.) professional leadership by architects since Imhotep has typically directed the efforts of both priests and politicians;
4.) the design issue of energy needs verification and legitimacy;
5.) many existing curricula appear not to be ideally suited to learning energy skills;
6.) solar design may be the key to making energy a more universal professional concern;
7.) assistance to those with a demonstrated energy commitment in professional education would be highly productive;
8.) Energy understanding does not come easily or quickly. It is experiential and, thus, needs the continuity of exposure through time.

JEFFREY COOK

Jeffrey Cook is Professor of Architecture at the Arizona State University, where he teaches solar and energy subjects at the graduate level. He holds degrees from the University of Manitoba and Pratt Institute, and has also studied at the Royal Academy of Art in Copenhagen. Professor Cook has lectured, written, and published on a wide variety of subjects; including planning and aesthetics. His book, Architecture Anthology is now in its third edition. His critical monograph on the Architecture of Bruce Goff will be published internationally in the spring of 1978.

Since 1972, his advanced design studios have especially focused on solar and energy sensitive architecture. He was a member of the solar research team in the 1973-74 collaborative study with TRW Systems on the Feasibility of Solar Energy for the Heating and Cooling of Buildings for the National Science Foundation. As a researcher and registered architect, he has been involved in a variety of research projects, professional studies, and building designs. His own unique home in Paradise Valley, Arizona, has been published internationally. Among other projects, a totally solar heated, passive house is now nearing completion under Professor Cook's direction. He currently is a member of the Committee on Design of the Ameircan Institute of Architects, a Director of the New Mexico Solar Energy Association, and Vice Chairman of the Arizona Solar Energy Association

THE ROLE OF GOVERNMENT IN ENERGY EDUCATION

Donald D. Duggan

ABSTRACT

It is urgent that the citizens of the U.S. be educated to the realities of the energy situation and with means of dealing with it. Energy education is more than merely conservation. It involves the understanding of all the facts of the energy situation and the options for the future. It involves broad educational efforts - in almost every discipline and subject area - behavioral and social sciences as well as physical sciences.

Impact on jobs and careers will be felt because of the energy scene. Some new jobs will be created, some careers will be affected by shortages or scarcity. The Federal government is presently spending 18 billion dolaars a year in Education. The role of the government is primarily that of leadership and support to educators as they seek to put the energy question before students of all ages.

The Department of Energy is consolidating the work of Energy Development and Research Administration and is also working closely with the National Conferences of States on Building Codes and Standards. Models, specific as well as integrated, school curriculum project and demonstrations are all part of the DOE educational efforts.

THE ROLE OF GOVERNMENT IN ENERGY EDUCATION

by

Donald D. Duggan

Our Nation, and indeed the world, is faced with what President Carter has described as an invisible crisis. Put quite simply, the energy situation is this: We have based our economies and our lifestyles on cheap and plentiful oil and natural gas. But these resources are finite, and while demand has been increasing, production is peaking and is expected to decline.

We are rapidly heading for an era of shortage and scarcity of energy, unless we make the transition to more plentiful resources, and finally to renewable energy sources. This transition will be neither easy nor automatic; but if we fail, the results may be disastrous. It has been said that in the energy problem lie the seeds of possible social disruption, political upheaval, and even global war. I feel that this is true, and therefore I feel that it is urgent that we educate our citizens to the realities of the energy situation, and prepare them to deal with it.

I have been asked to speak of the role of government in energy conservation education. In this context I would like to discuss three questions:

- What is energy education?
- Does energy education belong in the schools?
- What is the Federal role in energy education?

In defining and describing energy education, I would like to avoid a mistake made by many in this field. Energy education, if it is to be adequate and competent, involves for more than many educators seem to realize.

Unfortunately, many teachers, curriculum writers, and other educators have restricted what they call energy education to the more narrow field of energy conservation education. They seem to feel that once they have shown their students why we need to conserve energy, and once they have trained them to turn off lights, to turn down thermostats, and perhaps to drive 55 mph, then they have fulfilled their responsibility as energy educators.

My contention, however, is that energy education is a much broader and more profound topic. It must approach the student from at least three different perspectives - what I call the "Three C's of energy education:" Citizen, Career, and Consumer.

First, the energy educator must approach his students as Citizens. As present or future voters, they will be called upon to make numerous citizen decisions relating to energy policy and practice. If these decisions are to be made intelligently, they must be made with a depth of information and understanding seldom demanded before of the general public.

Every citizen needs an understanding of what President Carter has called our "invisible crisis." United States and world energy demand is increasing, while the supplies we depend on most (oil and natural gas) are running out.

The informed citizen needs to understand what our real energy situation is, and how it came about. The citizen also needs an understanding of what our options for the future are, and what actions are necessary to take advantage of those options. While there is no reason for pessimism, the citizen should understand too that there are certain time constraints built into the research and development of new energy sources. Dixie Lee Ray was fond of describing these constraints in an earthly way: "It takes one woman nine months to make a baby -- and putting nine women to work on it really won't get the job done in one month." Technological solutions may be found, but they will surely take time.

Decisions on immensely technical subjects must be made by quite ordinary people. For example, the issue of nuclear power faced the voters recently in a number of state-wide referenda, and most likely will appear on other ballots in the future. To vote intelligently for or against nuclear power, the citizen needs an understanding of that technology which would have staggered the imagination less than 25 years ago. How does a nuclear reactor work? Can it explode like an atom bomb? What is a meltdown? Which is preferable, storage or reprocessing of radioactive wastes? Can we be certain that there will never be a catastrophic accident at a nuclear plant? Or is absolute safety as unreal a demand there as in other areas of life? If so, what degree of risk is acceptable? What about the economics of nuclear power? Is is true that a coal fired power plant releases more radioactivity into the environment each day than a normally functioning nuclear plant? And so on and on....

The energy questions facing our citizens span every energy form, of course. We should not think that nuclear power has a monopoly on such problems. Questions on the environmental impact of strip mining, versus the dangers of deep mining of coal; the severe environmental and health hazards associated with the use of coal, either by direct combustion or as a source of synthetic liquid or gaseous fuels; the economic problems of conservation and solar energy; the national security implications of our growing dependence on imported oil; the practicality of small, individualized wind and solar power sources versus large central power stations - these are all questions which must be answered by voters. To answer them intelligently, the voter needs at least a basic understanding of the technologies involved, as well as a balanced appreciation of the environmental, social and economic impacts of these policies and technologies. Such questions ought not to be decided on the basis of fear, ignorance, or special interest, as has so often happened in the past.

Therefore, to deserve its name, the effort of energy education ought to be as broad as the energy problem itself. Just as energy touches almost everything we do, so the study of energy will pervade the entire spectrum of education - almost every discipline, almost every subject area, and almost every age level are involved - or should be. The physical sciences are obviously important to the study of energy, but so are the social sciences. Energy education is even relevant to such mundane subjects as home economics, driver's education, and industrial arts.

Real energy education needs to be firmly based in the physical sciences, with a clear understanding, for example, of the first two laws of thermodynamics. But neither the scientist nor the ordinary citizen can afford to be ignorant of the social, environmental and economic factors and trade-offs involved in energy production, energy use, energy conservation, and energy policy.

The second "C" of energy education is its approach to Careers. In helping our students prepare for life, we should be aware that a certain number of new careers will be created by the new forms of energy production and conversion which are coming on-line. The new field of solar energy is a good example. There will be a number of new jobs, for example as solar technicians and solar engineers. But the number of totally new energy-related careers will be smaller than many people expect.

That is not to say that the changing energy situation will not have a wide impact on careers. Almost every job and every career will be affected. For some, it will mean adding a new skill. Thus, for example, engineers and architects and plumbers and sheet metal workers and electricians will have to learn about solar technology and equipment. But on a broader scale, every job and every career will be impacted by the changing energy scene. Some will be affected positively, especially if new forms of energy are found. All will be affected negatively if we fail to resolve our energy problems, and enter into an era of energy shortage and scarcity.

Some of our students may choose careers in energy, as scientists, engineers or skilled craftsmen. We must provide them with the training and skills which will make such a career choice possible. But for all, energy education should help make career decisions as realistic as possible in an era of energy change.

The third "C" of energy education is the Consumer. This is the place for the "conservation education" of which I spoke earlier. Here the energy educator can present to the student a whole range of ways to conserve. Discussion of life cycle cost purchasing, energy efficiency techniques, and an energy conservation ethic and life-style are quite appropriate.

The potential range of energy conservation education is immense. In a curriculum development project funded by the Energy Research and Development Administration, now the U.S. Department of Energy, the University of Tennessee recently developed for us a curriculum guide for home economics teachers entitled Energy Conservation in the Home. This 335 page guide is a gold mine of practical information on energy conservation, structured along the lines of the typical home economics course.

The guide first puts energy in "An American Perspective," and then makes an effective presentation of the reasons why energy conservation is essential. Then follow sections with background information for the teacher on energy conservation in the house (the shell), environmental control, housing selection, food, clothing, personal care, entertainment, and improving energy efficiency in the home. The guide also includes a section of student activities, a bibliography, a glossary, and a section providing basic scientific information on energy for the more inquisitive teacher (or student).

Quite another approach to energy conservation education is taken by the Science Activities in Energy series being developed by Oak Ridge Associated Universities for the Department of Energy. Here we have a series of simple, hands-on science activities for the student in grades 4-5-6, which will demonstrate the scientific principles relating to energy use and energy conservation. This series currently includes sets of activities on conservation, solar energy, electrical energy and chemical energy. Both approaches, we feel, will help prepare the student to be a better informed consumer and conserver of energy.

The second question I have raised today is, "Does energy education belong in the schools?" There are many claims on the class day, with many competing interests crowding into already busy schedules. Each subject insists that its interests are vital, and deserve the attention of teachers and students. Drug education, sex education, physical education, career education, now energy education. What is a teacher to do?

Some time ago, Dr. John M. Fowler raised the issue of whether energy education was a legitimate subject for education. (Cf. "Does the Energy Theme Belong in the Classroom?" Today's Education, March-April 1976; and "Energy Education and the 'Wolf' Criers," The Science Teacher, March 1976).

I agree with Fowler's reasoning, and with his underlying basic premise: the energy problem is real, and it is here to stay. If we as educators really accept that fact, we have no excuse if we fail to help our students understand the energy dilemma, and prepare them to cope with its problems and its challenges.

Fowler describes the introduction of any social issue into the educational system as a three-stage process: awareness, mission-orientation, and integration. The energy topic, he believes, has passed the awareness stage ("There is an energy problem") and has entered the mission-orientation stage in most educational settings. ("We must conserve.")

Curriculum integration, however, is a much more complex task for the energy educator. Goals must be defined, a rationale must be agreed upon, and strategies must be designed and implemented. This part of the task for energy education is just beginning.

This brings us to our third question: "What is the Federal Role in Energy Education?" This is not the place to debate the larger question of the role of the Federal government in education as a whole. Let us accept as a given fact that the Federal government is involved in education in a big way (spending more than $18 billion annually).

In the area of energy education, I would maintain that the proper role of the Federal government is to offer leadership and support, especially where local efferts are poorly funded. As in every new field, there is much "reinventing of the wheel," and federal leadership can help avoid much needless duplication of effort.

In the more sensitive area often described as "values clarification," government, ought to tread very cautiously, if at all. I feel that only where there is a clear national consensus that a particular value is to be supported, as for example in the areas of good citizenship, racial equality, and so on, does government have any right to promote particular values in education.

It should be noted, by the way, that this "national consensus" is not something felt or presumed by educators. It is clearly expressed as a legislative mandate by our elected representatives. And in the whole field of energy policy, it is obvious that there is very little national consensus at the moment. Therefore the role of the government in energy education should now be to provide a fair, balanced picture of the many controversial issues connected with energy.

As an example of the leadership role of the Federal government in energy education, I would like to describe some of the energy education activities of the Department of Energy. Besides the curriculum-development projects

I will describe, and those mentioned previously, we also sponsor teacher training projects, student contests and activities, and conferences for educators such as the recent Washington conference, "Education Confronts the Energy Dilemma."

For persons in the building industry, and realted fields, a project begun by the Energy Research and Development Administration and now the concern of the Department of Energy will be of particular interest. The Federal government has provided assistance to the National Conference of States on Building Codes and Standards (NCSBCS) to develop a model energy conservation code for new building construction.

To foster the adoption and proper enforcement of this model energy conservation code, NCSBCS is also coordinating the effort with the National Academy of Code Administration (NACA) and the other major code groups to develop a training program for state and local building code officials. Energy conservation is a new factor in building design, and instruction of responsible officials on how it can be achieved is a necessary part of this program if it is to do its part in reducing U.S. reliance on imported oil. Additionally, NCSBCS will develop systems for revising the model code to incorporate energy-conservative innovations in new building construction.

This model code is being developed to serve two major purposes:

First: To provide, in language compatible with current building codes, energy conservation standards for new building construction that are based upon the technical criteria developed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, known as ASHRAE 90-75.

Second: To take into account codes reflecting a concern for energy conservation that have already been developed by various model code groups. This was done to ensure that the model code is compatible and, therefore, acceptable, to all the concerned code groups. Moreover, as opposed to those other codes, which did not consider all elements of ASHRAE 90-75 and all building types, this model code takes a comprehensive approach.

To assist in the implementation of the model energy conservation building code, a training curriculum has been designed, and tested in four states. As a result of this field testing, the courses are being revised, and we expect to be able to make them available to the states within a few months.

The training curriculum consists of a series of four courses for--

- Public administrators who have policymaking responsibilities for energy conservation measures that will be taken by states or municipalities
- Building inspectors.
- Plan examiners and code adminsitrators.
- Registered architects, engineers and other experienced members of the building industry.

The four courses in each series include:

- Introduction to thermodynamics.
- Energy conservation in buildings.
- Technical criteria in the model energy conservation code.
- Administrative provisions of the model energy conservation code.

The nature and extent of the material covered in these courses are designed to meet the specific needs of the various types of code officials.

For elementary and secondary schools, the Department of Energy has an ongoing curriculum development project with the National Science Teachers Association. At this time this project has resulted in field tested and completed versions of six interdisciplinary units, and drafts for nine additional units which will be field tested during the current school year.

The strategy of this "Energy Enriched Curriculum Project" is to provide teaching materials in energy, the environment, and the economy which will be suitable for insertion into existing courses. For example, the first grade unit, "The Energy We Use," is easily inserted into the typical first grade course which is based on an exploration of the young child's self identity. The second grade unit, "Community Workers and the Energy They Use," fits naturally into the exploration of the world in which the student lives, which takes place at that grade level.

The units which are designed for use in Junior High School, are "Transportation in the City" and "Energy, Engines and the Industrial Revolution." This latter unit, which consists of five lessons, is a particularly intriguing approach to a subject which is taught in all social studies courses in Junior High School. The industrial revolution is presented in a modern context, to focus these student's attention on the energy implications of the industrial revolution as it relates to the modern energy revolution.

The two units which have been developed so far for Senior High School in this project are equally interesting. "Agriculture, Energy, and Society" discusses the use of energy in our industrialized and mechanized agriculture. Perhaps the unit which has attracted the most attention in this series so far is entitled "How A Bill Becomes a Law to Conserve Energy." This unit, which is suited for a senior high civics class, takes as a case in point the bill mandating a 55-mph speed limit and follows it through the legislative process. The hope of course, is that when the student finishes the unit he will not only understand how a bill becomes a law, but why this particular bill became a law. He will be able to understand the energy and safety implications of the 55-mph speed limit, and perhaps even limit his speed to 55 miles an hour.

New units which were developed during the summer of 1977 and are being field tested in schools around the country during the 1977-1978 school year include the following:

> Third Grade: "People, Places, and Transportation." Using classification activities, picture studies, and other development approaches, students learn about transportation in the neighborhood, community and the nation.
>
> Fourth Grade: "Energy Networks." Study units include making a model of an electrical system and naming the parts that interact to make a system. In such units as "The Electrical Energy System in a City," sutdents learn about the importance of systems and how we depend on the electrical system in our community.
>
> Sixth Grade: "Two Energy Gulfs." A comparative case study of the energy potentials in the Gulf of Mexico and the Persian Gulf. Considers geography, geology, climate, production technology, etc., investigates the effect of oil production on two cultures.
>
> Sixth and Seventh Grades: "Bringing Energy To The People, Ghana and the U.S." One of the aims of this unit it to help students realize ways in which people use, control, and direct energy to enable them to accomplish things which to people in underdeveloped nations are merely dreams. A second aim of this unit is to help students appreciate how modern societies depend on the availability of energy. Through this approach students should recognize the importance of the conservation of energy.
>
> Seventh, Eighth, and Ninth Grades: "The Mathematics of Energy." This is a Junior High School packet designed to infuse energy into

the existing Junior High Mathematics Curriculum. The unit deals with the wide range of energy math including conversions, statistics, and the manipulation of energy units such as watts, calories, and Btu's.

Eighth Grade: "The Energy History of the United States." This unit charts the growth of American energy use and traces the history of the major resources of energy in the United States: wood, coal and oil. It examines the past interactions between man as an energy user and his environment.

Tenth Grade: "Energy in the Global Market Place." Here the students explore the role of energy in world trade and in the global balance of power. This unit examines the major energy have's and have not's and investigates the way in which energy prices are determined.

Eleventh Grade: "The New Westward Movement." Here the students investigate the effects of possible large scale resource development on the economy, the environment, and social structures of the Western United States. This unit compares this movement and it investigates other western resources.

Twelfth Grade: "U.S. Energy Policy -- Which Direction?" This unit is meant as a companion to "How A Bill Becomes a Law to Conserve Energy" which studied the workings of the legislative branch. This lesson concentrates on the executive branch of government and on the various forces that go into making national energy policy.

Twelfth Grade: "Energy for the Future." This is an overview of the United States alternatives to fossile fuels. It includes activities for estimating the contirbutions of solar, wind, nuclear, and geothermal power sources.

The Department of Energy also has a number of new contracts to have other energy education materials developed, tested and refined. The following projects should have materials available by the next school year.

We have recently signed a contract with Brevard Community College to develop a number of energy "modules" which will be suited for insertion in existing community college courses. A module is described as a unit of one to three classes in length, on a specific energy topic.

The State University of New York at Albany is developing junior and senior high science material on solar energy, and the University of Southern California has a similar contract for grades 1-6. Another interesting project in solar energy is a home study (correspondence) course, designed for builders and contractors, being developed by the Sheet Metal and Air-Conditioning Contractors' National Association. This course will lead to a much needed industry certification in solar applications.

Another project will produce four sets of teaching materials on energy, for the following grades and subject areas:

1. Grades 4-5-6 Science
2. Grades 4-5-6 Social Studies
3. Grades 7-8-9 Science
4. Grades 7-8-9 Social Studies

Each set of these materials is to have four units of up to three class sessions each. These units are to deal with the following topics:

- energy conservation,
- fossil energy (oil, gas, coal and synthetic fuels),
- nuclear energy and fusion,
- solar energy (including wind).

This material is to present an explanation of the various forms and sources of energy including background information for the teacher, learning objectives, teaching strategies, and student activities.

A contract with the American Association for Vocational Instructional Materials will develop teaching material for technical/vocational high schools, post-secondary schools and adult education courses in community colleges. The material will familiarize homeowners and future members of the building trades with energy conservation theory and techniques, which they can use as homeowners, contractors, or members of the building trades.

We are supporting the publication, by the National Science Teachers Association, of a newsletter for teachers and other educators, entitled Energy and Education. This newsletter will be published five times during the school year, and is available free by writing to the National Science Teachers Association, 1742 Connecticut Avenue, NW, Washington, D.C. 20009. It is designed to provide a much-needed communication link among individuals and groups interested in energy education.

Future plans involve development of materials for K-12 and community colleges, as well as support of student activities such as Science Fairs, and teacher training. Possible use of audio visual techniques as well as education television is also being considered.

In conclusion: the field of energy education is a broad and challenging one. We must help prepare students as citizens, as members of careers, and as consumers, for a new era. The role of the Federal government in that task, as I see it, is to provide leadership and support to educators across the Nation. I have described only some of the Federal energy education projects now underway. It is my hope that in the years ahead many other, even better projects will be developed, so that energy understanding and awareness will before long be a normal and accepted part of every school's curriculum.

DONALD D. DUGGAN

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Prior to the present title, he was Special Assistant to Assistant Administrator for Conservation and Environment, Federal Energy Administration. In that position, he established and maintained liaison with state and local governments to assist in developing energy conservation programs. He also developed and coordinated energy education programs for school and adult use.

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EDUCATIONAL ASPECTS OF ENERGY CONSERVATION PROGRAMS IN FEDERAL GOVERNMENT

Rene Vawter

ABSTRACT

The Oil Embargo, in 1973, brought the U.S. to the realization that our sources of energy were not inexhaustible--and that this and possible future crises demand attention. Two avenues are apparent -- develop new sources - or conserve what we have.

The Government, through its basic functions of:

(1) taking and giving money,
(2) making rules and regulations,
(3) restructuring physical systems,
(4) collecting and sharing information,

has attacked the energy problem through a variety of department and agencies - and primarily as an educating agent.

Through grants and contracts made possible by legislative action, individuals, industries, and states are motivated to develop workshops, seminars, demonstrations, feasibility studies, among other programs. Many of the departments have been related and interrelated - and most are now gathered together as the new Department of Energy.

Some of the "end-use" sectors which have had attention by the Federal Government are:

Buildings (Residential and Commercial)
Transportation
Industrial/Business Utilities

It is obvious that, in spite of these efforts a tremendous educational task still faces this country - that of accepting personal responsibility to help solve the energy problem.

EDUCATIONAL ASPECTS OF ENERGY CONSERVATION PROGRAMS IN FEDERAL GOVERNMENT

by

Rene Vawter

Only four years ago, October 1973, the Arab Oil embargo brought this country to the realization that our existing sources of energy were finite -- that a real crisis existed and demanded immediate attention.

It was during this period of awareness that the Federal Energy Office was born and when other Federal Departments and agencies turned their attention to possible short and long term solutions to the problem.

Two things were immediately clear. We had to develop new sources of energy. But even more important, we had to mount an intensive conservation effort to bridge the gap until new energy sources could be found and brought on line.

To bring about conservation on a scale that would have impact, it was recognized that a massive education program had to be undertaken. First, to educate Americans that there was an energy problem. Second, to educate Americans about how they could help solve it.

Today, I'd like to review with you how government educates, and particularly, how government worked over the past years to institute conservation education programs.

Essentially, Government carries on four functions in fulfilling its responsibilities to provide for the common good. Through its Agencies and Departments and under their enabling legislation:

1. it takes and gives money;
2. it makes rules and regulations;
3. it restructures physical systems;
4. it collects and shares information.

In performing these functions, Government becomes a teacher of sorts. It provides basic information to classes of constituencies in order to do its job. But in addition to just giving basic information, Government also takes on some other teaching characteristics. It operates on a motivational level in various ways:

- -- it carries on discussions through public hearings, providing new insights and viewpoints;
- -- it conducts special conferences and seminars with target audiences;
- -- it provides one-on-one counseling or tutoring;
- -- it offers special rewards through grants or tax incentives.

For example, in the first function--the giving and taking of money, various Federal agencies, through counselors and brochures, provide information on how to obtain financial assistance in a myriad of areas that includes everything from welfare to research grants. At the same time, Government also assist citizens in figuring their income tax. In performing this first fuction, then, Government acts as teacher--information-giver/motivator--by providing basic information, by counseling, by providing financial assistance or awards.

Likewise, in performing its second function--making rules and regulations, and in its third function--restructuring the environment, Government continues its pedigogical role. Before rules are made, or physical systems

States and with various end-use sectors.

State Grant Programs

First, let's examine how the Federal Government used educational techniques to further energy conservation through the States.

Congress enacted three legislative programs, the Energy Extension Service Act, the Energy Policy and Conservation Act (EPCA) and the Energy Conservation and Policy Act (ECPA) and mandated their implementation through ERDA and FEA. These two agencies set up a program structure for each Act, explained program requirements to the States, and to those who applied and met standards, rewarded them with grants.

The Energy Extension Service

The Energy Extension Service Act established an extension school for energy conservation in the States. In August, 1977, ERDA selected 10 applying States and awarded them $1.1 million each to conduct pilot conservation programs. The States, Alabama, Connecticut, Michigan, New Mexico, Pennsylvania, Tennessee, Texas, Washington, Wisconsin, and Wyoming are to provide information and technical assistance on a wide range of energy-related topics to citizens and institutions, such as small businesses, schools, hospitals, and State government agencies.

The Energy Extension Service, then, is an education grant system for the States that will become nationwide in two years. It is patterned after the U.S. Department of Agriculture's Cooperative Extension Service that has proven itself over the years as an effective information dissemination and education system. In fact, the Agriculture Extension Service is using its educational system not only to advance improved agricultural methods, but also to advance energy efficient agriculture technology.

EPCA/ECPA Funding

The Energy Policy and Conservation Act (EPCA) and the Energy Conservation and Policy Act (ECPA) designated that FEA was to provide grants to applying States that met legislative criteria. The purpose of EPCA is to motivate States to perform specific energy conservation activities:

- -- to plan mandatory lighting efficiency standards;
- -- to plan programs to promote the sue of carpools, vanpools, and public transportation;
- -- to develop namdatory standards relating to energy efficiency in State and local procurement practices;
- -- to develop thermal efficiency standards and insulation requirements for new and renovated buildings;
- -- to promote right turn on red where safety permits.

Over Fiscal 1977, 55 States and Territories were awarded part of the $22.5 million that was allocated for the program.

ECPA funding criteria requires that States:

- -- carry out continuing public energy conservation education program;
- -- effectively coordinate Federal, State, and local energy conservation programs within the State;
- -- Encourage energy audits with respect to buildings and industrial plants within the State.

All 55 States and Territories applied for sharing the allocated $12 million of ECPA grant money. By the end of fiscal year 1977, 22 States were funded and funding for the rest is currently in process.

Hopefully, with this Federal assistance, States will become effective energy conservation teachers.

But how have Federal Agencies themselves been educating (i.e., informing, motivating) the public towards energy conservation? I think this question can best be answered by examining Federal programs especially those operating over the past year. And, in order to examine those programs systematically, I have sorted them out by end-use sectors: buildings, both resiential and commercial; transportation; industrial/business; and utility services.

In examining these programs, you will see that, predominately, Government conservation programs involved technical assistance to specific voluntary audiences. Because Government has the advantage of money to fund certain studies and demonstration projects to gain information, it has the responsibility of sharing its findings with appropriate audiences through conferences, seminars, workshops, print material, and so forth. In these learning environments, the motivating factor is not learning to earn more money, but learning to save money, by learning how to save energy.

In some agencies, energy conservation programs do finance high-risk, long-term research. But, in these cases also, data is shared with appropriate audiences so that energy conservation technology can be advanced and its findings commercialized.

End Use Sectors

Buildings

For the residential home owners, various Federal Agencies have produced numerous information publications, telling the homeowners of this Country how to save energy and money.

FEA conducted Project Conserve Campaigns. The first centered around the completion of a questionnaire by a homeowner, with a computer analysis of potential improvement costs and fuel-cost savings being mailed back to the respondent within six weeks. The second provided the homeowner with a "Home Energy Savers' Workbook" that explained how homeowners could make energy audit calculations for themselves. From these calculations, the homeowner is able to decide which home imporvements are cost-effective. Materials for Project Conserve I and II have been sent to State Energy Offices for further implementation. Thus, far, 16 States are using the program in some form.

During 1976-77, FEA began implementing the Weatherization Assistance Program which, authorized by ECPA, provided that $27.5 million be distributed to applying States for the purpose of weatherizing homes of low-income persons, particularly the low-income elderly and handicapped. To assist the States, the program office has conducted extensive research to develop program models, training manuals, and other materials.

Twenty States thus far have applied and have received funding. Similarly, the Community Services Administration, through its Emergency Energy Conservation Service, assists low-income persons and families at local levels through its weatherization and crisis intervention programs.

As a complement to these low-income weatherization efforts, other Federal agencies also provide financial assistance to their constituencies. The Department of Health, Education and Welfare's (HEW) Administration on Aging provides grants to the States as authorized by the Old Americans Act. While this funding may be sued for various social services for the aging, assistance for home repairs, including weatherizing, is listed as a priority item.

The U.S. Department of Agriculture (USDA) has initiated a program that provides low-interest loans to low-income rural residents for home improvements that include installation of insulation. This program is a joint effort among USDA's Rural Electrification Administration and Farmers Home Administration. Both provide technical assistance to rural residents regarding the program.

For institutional building owners and operators, FEA, last year, developed materials and conducted seminars for personnel of local school districts, colleges, and universities to encourage energy conservation programs and retrofitting projects. Energy management conferences were likewise conducted by HEW's Health Resources Administration of the Public Health Service to provide energy-saving technical assistance to health care facility personnel.

For commercial building owners and operators, FEA and the General Services Administration (GSA) conducted energy conservation studies and demonstration projects and technical assistance programs primarily directed to designing operating and retrofitting federally owned and leased buildings. However, because such applications are transferable to commercial buildings, the information has been shared with commercial building owners. Over the past year, FEA conducted more than 450 energy management workshops with the business community, owners of office buildings, supermarkets, retail stores, and restaurants.

From a different perspective, the Department of Housing and Urban Development (HUD) conducted a national program to develop performance standards for new residential and commercial buildings. And, last year, FEA began developing training courses to assist appraisers to incorporate energy efficiency into real estate valuations and to assist loan officers to incorporate energy efficiency considerations into the loan/evaluation approval process.

In keeping with the traditional federal RD&D role, ERDA worked to develop methods, materials, and processes for retrofitting existing buildings, as well as developing new building forms and subsystems.

ERDA, in cooperation with other agencies and the private sector, also conducted demonstration project to further the development of new heating and cooling technologies for residential and commercial applications. Some demonstrations built and monitored energy use in homes with experimental energy systems, home with solar systems or a heat pump, measuring them against control units of conventionally heated and cooled homes. Some demonstration models incorporated building the latest energy conservation technology and hardware into low-to-moderate priced housing. Another demonstration was a commercial project to evaluate energy conservation technologies used in conjunction with restaurant operations.

ERDA also conducted RD&D on termally activated heat pumps; provided for the development and wide-scale adoption of new lighting systems; and undertook research on energy efficient and cost-effective home appliances. It conducted research and studies on: processes to produce electricity, processes and facilities to produce synthetic gases and fuels; the economic evaluation of such alternative techniques and processes; and the consideration of environmental, health, and safety concerned with each.

At the same time, ERDA developed and disseminated information about these new technologies through the publication of technical manuals, guidebooks, research newsletters, and through seminars and workshops.

Also working in the R&D area, the Department of Defense investigated new building materials; computer-assistance for analysis and design; seawater exchanges for cooling; new lighting design criteria; and the means to detect and quantify energy losses.

The Department of Commerce (DOC) through its National Bureau of Standards (NBS) worked primarily as the research and monitoring arm of Federal agencies; professional societies, organizations, industries, State and local governments, and translated technical information into consumer-oriented publications.

Transportation

Transportation took 26 percent of our Nation's energy in 1976, with almost 100 percent of that system dependent upon petroleum. Federal agencies have attempted to deal with this problem through two general strategies: short and long term.

For the short term, agencies such as the Department of Transportation (DOT), the Environmental Protection Agency (EPA) and FEA have developed technical assistance programs and materials to encourage home-to-work-site use of carpools, vanpools, and public transportation. DOT directed Federal-Aid highway funds to State and local projects for reducing single occupant use of automobiles, projects that planned and implemented priorty highway lanes for carpools and buses, fringe parking areas, and vanpool programs.

FEA conducted a series of vanpool workshops to provide information about successful vanpool programs to major employers. Company vanpool programs rose from 66 in 1976 to about 125 in 1977. As a result of FEA efforts with insurance companies, new classifications and reasonably priced vanpool rates were established by the Insurance Services Office and accepted by 46 States.

DOT, FEA, and EPA also worked to promote conservation by developing driving techniques and vehicle maintenance material, and publishing fuel mileage guides aimed at promoting a market shift toward fuel economy cars. Over 19 1/2 million fuel mileage guides were disseminated for the 1977 model year. Under EPCA mandates, EPA is required to develop test data on the fuel economy of automobile models each year; FEA is required to publish the information for consumers; and DOT is to enforce publication dissemination.

Last year, DOT's Urban Mass Transit Administration (UMTA) provided the usual funding to State and local governments for developing testing, and demonstrating equipment, techniques, and methods to reduce urban transportation problems and improving mass transportation service. It also offered managerial training grants and university research grants to expand local urban transit knowledge and information.

For the long term solution to petroleum use in the transportation sector, Federal agencies such as ERDA, the National Aeronautics and Space Administration (NASA), and DOD are pursuing R&D alternative automotive energy systems, alternative fuels, and alternative systems to reduce fuel consumption of heavy-duty trucks and buses.

DOD and NASA conducted major RD&D activities related to energy conservation in air transportation, including more fuel efficient aircraft.

ERDA's R&D work in pipeline transportation was unique because virtually no work had been done by Federal agencies or industry to conserve energy in pipelines. Current plans call for development and demonstration of waste heat recovery cycle for retrofitting existing pipeline pumping stations.

During the past fiscal year, the Maritime Administration cost-shared with its related industries energy conservation research projects such as energy use imporvements in ship building and ship repair. The Maritime Administration sponsored, with maritime industry leaders, technology transfer seminars, providing information which is normally not shared because of the competitive edge such improvements give the developer.

Industry

The industrial sector, in 1976, consumed 25 percent of all the energy used in the United States. To help combat industrial energy inefficiencies which evolved over past periods of abundant and low-cost fuel, FEA, Commerce, and ERDA provided technical assistance to the most energy-intensive industries and the most consumptive companies within those industries. Based on research, frequently done by NBS, the agencies offered seminars, workshops, demonstrations, guidebooks, case histories, and consulation opportunities to the cement industry, the food service industry, the retail food stores industry, and the meat packing and baking industries. The agencies also assisted small and medium-sized organizations, companies, manufacturers, and commercial enterprises to establish or improve energy conservation programs.

FEA's Appliance Efficiency Program, operating in conjunction with NBS, published energy efficiency targets for appliance categories, proposed test procedures, and conducted hearings. As industry moves to meet these goals, FEA and the Federal Trade Commission will provide consumer education programs to stimulate the sale of energy efficient products.

Both FEA and ERDA carried on agricultural conservation efforts, working with USDA to fund studies and State demonstration projects and to provide technical assistance, primarily through USDA's Extension Service.

FEA also began the administration of the reneawable-resources obligation guarantee program. The purpose of the program is to stimulate the purchase and installation of energy conservation equipment in an existing building or industrial plant by providing a Federal loan guarantee for up to 90 percent of the financing.

ERDA, with NBS, provided the R&D focus. One joint ERDA-NBS effort was to develop and demonstrate imporved measurement technology for monitering industrial processes. NBS also has developed a technique for infrared thermographic analysis which depicts heat losses in energy-intensive industrial operations. ERDA worked toward: recapturing and using waste energy expelled by widely used energy-intensive industrial processes; improving processes and equipment within energy-intensive industrial processes; and evaluating technical feasibility of using coal or waste matter as fuel.

Public Utilities

Electric utilities took the lion's share of U.S. energy in 1976 with its consumption rate of 29 percent. Tragically, conventional methods of generating electricity was about 65 percent of energy input in the form of excess heat. To militate against this waste, a number of Federal agencies have focused on demonstration sites of total energy systems. Agencies such as the Department of Housing and Urban Development (HUD), NBS, ERDA, and HEW arr funding, monitoring, and building sites to provide utility/municipal services-- electricity, space heating and cooling, water and waste treatment, and solid waste disposal--that can be processed through a single plant.

Through such integration, fuel, normally wasted when these services are supplied by separate sources, is conserved by means of heat recovery.

HUD has been conducting several such demonstration projects, called Modular Integrated Utility Systems (MUIS). Under construction is a MIUS-HUD demonstration site in St. Charles, Maryland. It will provide integrated utility services for a community with an equivalent of 900 dwelling units, and includes some commercial areas. The demonstration is being carried out by a private developer on a cost-sharing basis. HUD is also co-funding, and monitoring through NBS, a MIUS demonstration site of 486 dwelling units in Jersey City, New Jersey. This project provides site heating and cooling by using waste heat from electrical generation. During 1975-76, this cogeneration saved $60,000 and 160,000 gallons of fuel oil. Fuel efficiency was 61 percent over conventional site configuration.

NBS has been providing technical support to HUD, providing system design and technical measurements, and monitoring and assessing the benefits of MIUS projects. As a result of its experience, NBS also advises ERDA and the private sector on integrated utility site technology.

EPA is also researching aspects of the total energy system--resource recovery, waste management, waste-to-energy, and source separation of recyclable waste components. By assuming part of the financial risk, EPA assists State and municipalities that are trying out such new ventures.

Likewise, HEW is conducting an integrated utility system project on campuses and medical complexes.

ERDA's Community Systems Program has been involved in research and development activities to evaluate the role of integrated utility systems, urban density/energy relationships, zoning and land-use patterns, urban waste, and innovative technologies for communities.

ERDA has also worked closely with industry to coordiante and merge private and Federal efforts in field-testing promising technologies, such as fuel cell generators and advances in energy storage. ERDA's Electric Power Transmission program addressed itself to new source generation technologies of fossil, nuclear, and wind.

The Solution

And so, you might ask why, with all these Government energy conservation programs, why isn't the energy problem solved? My many pages of examples of Government conservation programs point up the fact that Government alone cannot solve the problem. Even the new Department of Energy established to attack the energy problem with a united effort and on a larger scale, is not enough. This is not to say that Government efforts are worthless. It merely means that in a democracy, Government programs are not enough.

Our all-time high petroleum import rate, for example, demonstrates that after all the Federal money and manpower and research and technology, the American people still have not accepted the truth--that there is an energy problem. The long gas lines during the embargo, the high cost of energy bills, the natural gas shortages last winter with its accompanying layoffs and school closings have not convinced them.

The solution to the energy problem rests with each of us. This does not mean that the Government's job is over. It means that we must work together, that we all must take on some of the responsibility of educating others, each in his/her own way and in his/her own milieu. It means that each of us must provide the leadership to point up the fact that there is a national energy problem and that it is imperative that we all get serious about the business of conservation because other long term solutions will not arrive soon enough.

RENE VAWTER

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Prior to working with the Federal Government, she taught school for sixteen years at the elementary, secondary and college levels. She also served as Director of Public relations for several colleges.

Ms. Vawter holds a B.A. degree in Philosophy from the College of St. Francis, Joliet, Illinois, a M.A. degree in Journalism from Marquette University and has undertaken post-graduate work in Communication at the University of Iowa

LOCAL GOVERNMENT AND ENERGY CONSERVATION EDUCATION

David W. MacKenna

ABSTRACT

The Institute of Urban Studies at University of Texas at Arlington is a Texas organization created by a legislative act in 1967 to function basically as a public sector research organization directed to the problems of modern society. Although it was not until 1973, during the embargo, that the Institute became concerned with energy, a series of surveys, conferences, and workshops has provided leadership for Texas municipalities as they design plans for delivering services with minimum drain on fiscal and natural resources.

The initial effort was a survey to determine the effects of less abundant fuel on municipal service delivery and any conservation measures used by Texas cities in response. The study, among other things documented the change in price of gasoline and led to a second study focused on the municipal budget impact of escalating fuel product prices on to consumers or programs for conservation.

In 1975, the Title III Energy Policy and Conservation Act implemented energy conservation planning and with Region VI FEA, sponsored a one-day seminar, the proceedings of which together with a conservation guide for municipalities have made a direct contribution to energy planning efforts in Texas.

LOCAL GOVERNMENT AND ENERGY CONSERVATION EDUCATION

by

David W. MacKenna

Introduction

Among public officials, if not the public at large, there is increasing recognition of the fact that the nation faces a growing imbalance between our demand for energy products and our ability to meet that demand. Since the "panic days" following the 1973 oil embargo, we have heard claims and counter-claims about the seriousness of national energy problems. On the one hand, experts have taken data, much of it from the Oil and Gas Journal, and have told us that in 10-15 years national gas and oil reserves will be gone and we will have to turn to some other energy form. On the other hand, we have heard that the crisis is little more than a hoax - a scheme - if not devised, at least promoted by the major oil companies to escalate profits by promoting the price of petroleum products.

Four years have sharpened our perception of world energy problems, and it now appears that truth lies somewhere between these two extremes. In the most basic sense, this has been a national education effort. To cite some examples, we have learned:

- That 120 billion barrels of crude oil exist in the U.S., recoverable under current technology, at current prices. This would appear to represent about an 18 year supply.
- That only 1/3 of the oil in an average well is brought to the surface under present methods. The remaining 2/3 could be extracted by secondary and tertiary recovery methods which exist. These methods are, of course, expensive.

- That about 1.8 trillion barrels of oil are locked in shale in the Rocky Mountains. Methods exist to extract the oil, yet again, such methods are expensive.
- That another 2 trillion barrels of oil exist in tar sand, primarily in Canada. Shell is constructing a major plant to extract the oil; however, production will not begin until the mid-1980's. Again, there are major costs associated with this production.
- That coal gasification and atomic energy represent other major options; however, environmental and monetary costs are high and additional time is required for technological refinement.

These two issues, the ever increasing expense of energy production, and the need to extend the margin of time (if you will) for imporving recovery technology leads us to the topic of Energy Conservation and Local Government which I want to comment on for a few minutes. I might add that these issues also focus attention on the topic of this conference, energy conservation education.

However, before I introduce that topic, it might be well to identify and describe the mission of my organization, the Institute of Urban Studies (IUS), The University of Texas at Arlington. IUS was created by a special legislative act in 1967 and placed at The University of Texas at Arlington to function basically as a public sector research organization. The mandate empowers our staff to provide research, training, and advisory services to public and private agencies directed to the problems of urban life in modern society. The change is quite general and the legislation, of course, had as its backdrop the turmoil of the cities in the 1960's.

An Initial Educational Effort

Among the numerous urban issues and problems we have explored, I must say that it was not until 1973, during the embargo period, that we turned to energy. Prompted by the concern of many Texas local government officials (a group which we see as our primary clients), the IUS staff initiated a statewide survey to determine: 1) the effect of less abundant fuel on municipal service delivery, and 2) the conservation measures implemented by Texas cities as a response to these conditions.

During mid-1974, a report (Energy and Local Government), was issued to all Texas municipalities based on responses from 214 cities and 76 counties. As I look back today, I view this as a fledgling effort. We were hopeful that we would find some unique and possibly innovative city responses which, through the medium of the report, we could pass along to those less inventive. However, today I don't know that you would find anything in the report particularly unique. The report does, in my judgement, stand as an example of a highly important educational technique. It represents an attempt to raise the level of sensitivity to an issue area with a client group wherein a university organization is known and has a reputation which extends over time.

In this study we did find and report that:

- Seventy four percent of the respondents experienced fuel related problems, including escalating product costs, uncertainty about the future availability of fuel supplies, and actual shortages of gasoline and diesel fuel.
- The primary service areas affected were street construction and maintenance, law enforcement, and sanitation.
- A relationship was observed between the population of cities and whether or not they were adversely affected by the embargo. Ninety one percent of the cities over 5,000 reported energy related difficulties while only 59 percnet of cities under 5,000 reported such problems.

Cities and counties were also asked to list in the survey response discrete energy conservation measures undertaken in their jurisdiction. Approaches/methods reported included the following:

- The development of formalized contingency plans to reduce city services.
- Reduction in the use of governmental vehicles -- less take home use, more efficiently planned trips, reduced police patroling, patrol downtown areas on foot, voluntary reduction of speed.
- Reduction in the frequency of solid waste collection, street sweeping.
- Purchase and use of smaller vechicles and radial tires.
- Limited testing of fire equipment.
- Establishment of departmental gasoline allocation plans.
- Increased use of two way radio communication.
- Ceased use of diesel fuel for herbicide/insecticide.
- Reduced lighting (inside and outside buildings) on street lights, park lights.
- Reduced night activities, meetings, etc. and building temperature adjustments.
- Reduced water pressure and level of water in storage facilities.
- Established daytime building maintenance.
- Several cities undertook active programs to encourage citizen conservation including, in some instances, council appointment of citizen conservation committees.

In my judgement, one of the most significant aspects of the study was the documentation it provided concerning changes in the price of gasoline. In 1972, gasoline cost many larger Texas cities only about $.11/gallon. During the survey (Spring, 1974) 30 percent of the respondents were paying in excess of $.40 per gallon.

Energy and Local Government: The Price of Crisis

After the oil embargo was lifted, we were left with this altered price structure and many city officials were quite concerned about how significantly higher product costs could be absorbed into municipal budgets. IUS, therefore, undertook a second project and report to the cities in 1975 to examine this one issue --- the municipal budget impact of escalating fuel product prices. This study provided a detailed examination of the inflationary effects of energy product costs on municipal budgets in 20 Texas cities of varying population. Research efforts examined product price changes during the fiscal years 1970-1975.

Again, the primary goal of the project was educational. The specific objectives were twofold: 1) to document the fiscal impact of fuel product price changes on the sample of Texas cities, and 2) provide city officials with comparison models for contrasting local product costs with unit price and total expenditure trends in other Texas cities of similar population.

By applying rather simple computer techniques we developed some prototype models which enable cities not participating in the study to compare prices paid for given petroleum related products with mean prices paid in cities of similar population. Examples of products we included in our study were gasoline, diesel fuel, motor oil, anti-freeze, batteries, tires, chlorine, asphalt, and electrical/gas utilities.

I will not present a vast amount of statistical data here to illustrate the conditions we observed. Let me say that the major and overriding conclusion of the 1975 study was that in the years 1970-1975, fuel related product costs (including utility costs) represented, on a percentage basis, the most rapidly increasing expense area in the operating budgets of Texas cities. For our 20 city sample, the mean percentage increase in fuel related expenditures was 71.8 percent during 1970-1975. During the same period, total general fund expenditures increased by a lesser figure, 59.7 percent -- (12.1 percent) difference. Short of conservation programming, it seems that the city's only options were to decrease service or pass these costs on to the taxpayer.

Energy Conservation in Buildings: An Educational Forum

Recognizing that local and state officials must communicate and cooperate in the development of effective energy conservation programs in their respective jurisdictional areas, IUS and the Region VI FEA (now DOE) staff co-sponsored a one-day seminar on Energy Conservation in Buildings during December, 1976. The seminar was one regional activity in response to federal energy conservation planning requirements under provisions of Title III, the Energy Policy and Conservation Act of 1975. In brief, this legislation authorized FEA to provide $50 million annually in planning funds to the states for fiscal 1976, 1977, and 1978. Under this Act, a voluntary three phase planning program was established which has as a goal a five percent reduction in total state energy consumption by 1980.

Our seminar, in support of this state planning effort, drew together representatives of several state energy offices in Region VI, local government officials (primarily building inspectors) and individuals representing construction or energy-oriented organizations in our five state federal region.

The session provided attendees the opportunity to discuss different approaches in implementing a statewide conservation effort, some explanation of available technical materials and data, and a forum for the interchange of ideas and experiences between persons with construction code responsibilities in cities, state agencies, and the Southern Building Code Congress.

There is not time here, nor would it be appropirate, to explore the technical dimensions of the array of information presented during the session. For those who are interested, such information is available in the published proceedings of the conference.

Two aspects of the program are; however, rather significant. [illegible]t, for those 60 public and private sector representatives in attendance, the program was an important energy conservation education experience and indicative of the way in which the university community can cooperate with public agencies in developing/implementing community programs which focus on societal issues or needs.

Second, recent discussions with Region VI Department of Energy staff representatives suggest that the program, including broad circulation of the proceedings, made a direct contribution to state energy planning efforts in Texas. At the time the conference was held, some FEA officials were concerned about limited progress being made in Texas, in response to the voluntary conservation planning program outline in provision of the Energy Policy and Conservation Act of 1975. Texas now has a state energy conservation program designed to reduce total fuel consumption by 5.7 percent by 1980. Many individuals, agencies, and activities contributed in the development of the Texas plan. However, our joint project with FEA was an important session at a critical point in state planning efforts.

I can add that in recent announcements which have crossed my desk, I can see conference recommendations appearing in planned activities from the Governor's Office of Energy Resources. This is the agency directly responsible for statewide energy conservation planning in Texas.

- During November, 1977, a series of eight local government workshops will be held to promote energy conservation in city service delivery.

- In early 1978, nineteen energy offices will be established in selected Texas cities to provide a free home energy audit service to homeowners.
- A grant program has been established which provides $200,000 anually to fund worthwhile energy conservation projects to local agencies that qualify as "political subdivisions" under state law.
- Twenty-four regional meetings are planned during 1978 to promote a model energy conservation code developed from ASHRAE Standard 90-75, "Energy Conservation in New Building Design." The new code is to be pilot tested in six selected Texas cities.

An Energy Conservation Guide for Municipal Services

Observations thus far have traced IUS energy conservation programming in a historical manner. Our most recent activity began during the summer, 1976, and follows the previously described energy conservation/fiscal impact reports to the cities in 1974 and 1975.

Several studies have dealt in detail with certain technical options for energy use in municipal service delivery. However, a collection and assembly of such information into a viable, comprehensive program for energy conservation management at the local level has been attempted on a rather disjointed, city-by-city basis. The absence of systematic procedures to transfer effective conservation measures from city-to-city has resulted in a large and repetitive expenditure of human and resource energy. Local governments, without the staff time or expertise to research and formulate their own comprehensive conservation programs may become discouraged at the dimensions of the task, and thereby miss opportunities for significant cost and energy savings.

Recognizing this condition, two members of our staff have prepared the Texas Conservation Guide for Municipal Services, as a compact source of up-to-date energy conservation information for Texas local governments. Conservation

Ideas were gathered from a recent survey of Texas communities, as well as a national search for the most recent and relevant information.

Effective energy conservation management receives considerable attention in the report. The "conservation options" included are grouped into functional areas for easy reference. Since many of the options represent discrete conservation practices underway in selected Texas municipalities, appropriate contact personnel are listed to assist persons that might be interested in more detailed information. The Guide presents information directed to:

- Municipal Administration
    - City Planning
    - Purchasing
    - Building Codes and Ordinances
    - Conservation Management Information Tools
    - Employee Participation
    - Community Involvement
- Public Buildings
    - Building Site and Envelope
    - Interior Building Systems
    - Building Operations
- Transportation Systems
    - Roadway and Traffic Control Efficiency
    - Public Transit Services and Facilities
    - Ride Sharing Programs
    - Bikeways and Walkways
- Municipal Utilities
- Alternative Energy Sources
- Miscellaneous Options

In summary, this report represents the initial research basic to the development and implementation of a comprehensive energy conservation management program at the municipal level. We view the project and resulting report again, as an energy education effort. Copies are being distributed free of charge to cities throughout Texas and I would expect that a series of training programs will be held, centering on recommendations/options in the Guide, during the next several months.

I might add that we are presently working with one city of 50,000 population to "field test" the Guide and its usefulness in developing a comprehensive energy conservation plan. Although this project is now only in the initial stage, we anticipate the publication of a case study on the experience which, like other IUS reports, will be widely destributed to Texas cities.

I will close by saying that as Mark Twain observed many years ago, "Few things are harder to put up with than the annoyance of a good example." This observation, I feel, is particularly appropriate to describe the role of municipal government in relation to energy conservation in this society. As guardians of a public trust, they have an important responsibility to conduct municipal affairs in such a manner that they deliver required services with a minimum drain on fiscal and natural resources. In our supportive role to Texas communities, we at the Institute are attempting to do our part in support of that responsibility through research, education, and direct advisory assistance.

DR. DAVID MACKENNA

Dr. David MacKenna is Senior Research Associate at the Institute of Urban Studies at the University of Texas at Arlington. Dr. MacKenna has been with the Institute in a full-time research capacity for five years. Previous to this affiliation, he served as Professor of Public Administration at Texas Woman's University, Denton, Texas.

Since joining the Institute staff in 1972, he has published a number of monographs, books, and articles in public management, housing, land use, and energy. During 1974-75 he co-authored two publications (1) Energy and Local Government, a study of problems and responses of Texas cities and countries after the 1973 oil embargo, and (2) Energy and Local Government: The Price of Crisis, an examination of the fiscal impact of changing energy product costs on municipal budgets.

A REPORT
On
THE NATIONAL ASSOCIATION OF HOME BUILDERS ENERGY CONSERVATION EDUCATIONAL PROGRAMS

Thomas D. Caldwell

ABSTRACT

The National Association of Home Builders has as its primary goal, through its 100,000 members in local associations, the provision of the best possible housing for all Americans at prices they can afford.

The NAHB Research Foundation is a subsidiary which does research and testing on the application of equipment, materials, and construction techniques for manufacturers, trade associations and governmental agencies, as well as for the NAHB itself. The energy conservation efforts strive to produce houses which operate at peak efficiency for savings of energy and costs.

The "Energy Efficient Research" house, built in Maryland this year, is a joint NAHB Foundation, and HUD project. A two-way seminar program "Designing, Building and Selling Energy Conserving Homes" has been piloted and revised. Ten nationwide seminars are now in progress, and the materials may be adapted for shorter educational programs.

THE NATIONAL ASSOCIATION OF HOME BUILDERS
ENERGY CONSERVATION EDUCATIONAL PROGRAMS

by

Thomas D. Caldwell

Introduction

The National Association of Home Builders (NAHB) is the dominant trade association in the residential construction industry. The corporate headquarters are in Washington, D.C. Its nearly 100,000 members are also members of nearly 700 affiliated state and local home builders associations.

Of the total membership, approximately one-third are residential contractors and the other two-thirds are supportive firms in the industry, such as banks, savings and loans, mortgage companies, equipment manufacturers and suppliers, subcontractors, architects and others who have a business stake in the residential construction industry.

Historical Record

The primary goal of the NAHB and its members has always been to provide the best possible housing for all Americans at prices they can afford. In the area of energy conservation this has also meant to continue to do research on the application of equipment, materials and construction techniques to produce housing that can be operated at peak efficiency for savings of energy and costs.

A separate but wholly owned subsidiary of the National Association of Home Builders is the NAHB Research Foundation which has its own offices and laboratories at Rockville, Maryland. The Foundation does research and testing not only for NAHB but supports itself through contracts with manufacturers, trade associations, and governmental agencies.

Over the years, NAHB and its Research Foundation have carried on a continuing program of research, laboratory testing, and field testing of new and old materials and techniques to provide more scientifically engineered and built housing. Examples of this applied research are the "Time and Material Analysis Program" (TAMAP) through which a series of Research Houses were actually built using industrial engineering controls and techniques. The knowledge gained was passed on to the NAHB members to help them produce better and more efficient housing in their own areas.

In the same vein, in 1953-54 an "Air Conditioned Research Village" consisting of 30 homes was sponsored and built by NAHB and its members at Austin, Texas. Equipment and material suppliers and air conditioning manufacturers also participated in this controlled experiment where the 30 houses were continually monitored for a year with families living in the homes. The results have had a reaching effects on the production of less expensive and more efficient air conditioning equipment and the improvement of the design and construction of energy conservation housing.

In more recent years the principles of "Value Engineering" have been applied to the procduction of an "Optimum Value Engineering" house in Maryland, built by an NAHB member according to the NAHB Research Foundation's specifications. Again the results of this controlled experiment have been publicized to the NAHB members who have applied them to housing in the areas, producing better and more efficient homes for more families.

This year, 1977, the NAHB and its Research Foundation, with the cooperation of the Department of Housing and Urban Development, had built in Maryland the "Energy Efficient Research" House.

This house was open to the public in May 1977 and a manual describing the procedures used in this house was distributed to the public and NAHB members. A copy of this report is given in the appendix.

NAHB and its Research Foundation have been, and continues to cooperate with government agencies and other groups in a wide range of energy educational research activities. For example, with the Federal Energy Agency the NAHB participated in the "Retrofit" program which produced valuable information for present home owners on ways to conserve energy through applying energy conserving procedures to their homes. Additional studies on Energy Conservation in housing have been made with the Federal Energy Agency, the Energy Resource and Development Agency, Department of Housing and Urban Development, Bureau of Standards, the Universal Wool Association, the Department of Commerce and Colorado State University on Solar Energy and other research programs on many more cooperative projects.

In addition, our members, locally and statewide, have participated with energy producing utilities in building and publicizing energy conserving homes.

All of the efforts of NAHB and its affiliated members in developing energy conserving housing have been given wide publicity through the press, radio, television, and shelter and trade magazines for the benefit of the general public.

Another field of energy conservation education in which the NAHB is presently heavily involved is in the presentation of nationwide series of seminars entitled "Designing, Building and Selling Energy Conserving Homes." This two-day seminar program was researched and developed by the NAHB. A series of four initial seminars was presented. After some revisions, a new series of ten seminars is now being presented.

This new seminar series is co-sponsored by the NAHB, the Department of Housing and Urban Development, the American Gas Association and the Edison Electric Institute. It is estimated that about 2,000 builders, architects, HVAC contractors, utility representatives, and subcontractors will be reached through this seminar series. In addition, NAHB's local associations across the country are using some of the same educational material for shorter educational programs locally which, with the sale of the seminar materials to members, will provide energy conservation education on several thousand more people in the building industry.

The scope of information contained in the two-day seminar is indicated by the following program headings used in promotion of the meetings:

Program

First Day

Current Energy Situation Facts

Presents the hard facts about the current and future energy situation in the country. Energy standards -- local, state and national. What will happen to the price of oil, gas, electricity? Will we run out of gas? Is there an oil shortage? Will there be one? Are the shortage stories contrived? What's the truth about cost? What difference will all this make to home builders in terms of sales or rental properties now and in the future?

The A.B.C.'s Of Heat Flow

Knowing the names of the players helps to follow the game. One must understand the key terms before selecting cost effective energy conserving products and systems. BTU, BTUH, "R" Thermal Resistance. "U" Rate of Heat Flow, heat loss load, heat gain load, annual energy use and cost etc. are defined.

Home Energy Use

What are the major opportunities to save energy? How much energy is used? What is it used for heating, cooling, water heating, refrigeration, lighting, miscellaneous? Where is the most heat lost or gained -- through the ceiling, walls, windows, doors, floor, infiltration, foundation? Where and how to use the most savings for the least extra cost.

The Local Climate

What is it? How is it used to determine heating and cooling loads and annual operating costs? How and where to find it, its relation to cost effective design.

How To Determine Heating Load

A quick and accurate method to remove the magic from heat loss determinations for walls, ceilings, floors, windows, etc. and for the whole house. A look at the load determination method used by HVAC subs Heat load design for ceiling, walls, windows, infiltration, ducts and the whole house. Insulation Manual System, Manual J and practical examples.

How To Determine Cooling Load

A quick and accurate method to remove the magic from heat gain determinations for walls, ceilings, floors, windows, etc., and for the whole house. The tricks of the trade equivalent temperature difference, solar load through glass, infiltration, latent load temperature swing duct loss, etc. The Insulation Manual method for cooling load determination and a look at the Manual J method used by HVAC subs.

Selecting and Sizing Mechanical/Electrical Equipment

The importance of equipment sizing, how to size equipment, the effect of equipment size on annual energy cost, energy efficiency ratios. Heat pumps, what do they do? How good are they? Can they be used in climates that are not mild? How are they sized? Do's and don'ts. What to watch out for. The newest energy saving gas equipment will also be discussed.

More on Mechanical Equipment and Systems

More information on equipment sizing, sizing the air handler, capacity versus heating cooling output in relation to loads and climate. Sizing and locating ducts systems. Cost effective duct systems. What to do about duct systems to single story split levels, two stories. What about dual systems? Controls -- types available, do's and don'ts, clock thermostats.

Second Day

Annual Energy Use and Costs

Converting heating and cooling loads to estimated annual operating costs for heating and cooling. Specific examples for gas, oil and electric energy. Pros and cons of fuel energy selection cost comparisons. How to compare real costs. Rate structures -- how to find out the basic energy rate cost for heating and cooling.

Wrap It Up Right

Do's and don'ts of insulation installation. New energy conserving construction details. Selecting windows and doors. Weatherstripping and caulking Construction tips to control air infiltration. How to get what you pay for in installed thermal value of insulation and other products.

Designing and Building Energy Conserving Homes

A series of practical and cost effective techniques for reducing heat loss, and heat gain, including some techniques that reduce first cost.

How To Select Cost Effective Energy Conserving Features

An easy to follow design procedure for getting the most return on investment in terms of annual energy cost savings as related to the additional cost of extra energy conserving features. Adapting the procedure to local energy availability, different fuels and local climate variations. How to use "Adjusted Payback Periods" as a selling tool.

Advice To Buyers

How does the energy conserving home effect comfort? What is the real truths about different thermostat settings and their effect on reducing energy costs? Why does the energy conserving home feel more comfortable with the thermostat set lower in winter and higher in summer? The effect of household life style on annual operating costs. What to do and what not to do to keep your energy bill down and get the most out of your new energy conserving home. Tips for reducing household energy costs.

Selling The Energy Conserving Home

Sales methods and merchandising tips. Sales brochures, advertising points for the salesman, special promotions.

A comprehensive 400 page manual of original research and additional reference material is used as a text book.

Publications

The NAHB has a weekly newspaper and a monthly Journal which is circulated to all members, various governmental agencies, libraries, trade associations and members of Congress. A continuing educational series of articles on energy conservation in housing is a regualr feature of these publications. These articles provide factual, pragmatic, useable energy conservation educational material.

NABH also develops various technical publications on energy conservation for sale to members. Some representative titles of these publications are: "A Builders Guide to Energy Conservation," "Insulation Manual for Homes and Apartments, Solar Energy - Proceed with Caution, Manual of Lumber and Plywood Savings Techniques", and the newest manual published October 1977 - "Thermal Performance Guidelines for One and Two Family Dwellings." Audio/visual presentations on energy conservation are constantly being made available also.

Conventions and Meetings

Energy conservation in housing programs are a major part of NAHB's Annual Convention as well as state and local conventions and meetings.

Summation

NAHB and its affiliates will continue to place even greater emphasis on energy conservation research and education as a contribution to the nation's program of energy conservation in construction.

Appendix

ENERGY EFFICIENT RESIDENCE
RESEARCH AND DEMONSTRATION PROGRAM

Developed for
U.S. Department of Housing and Urban Development

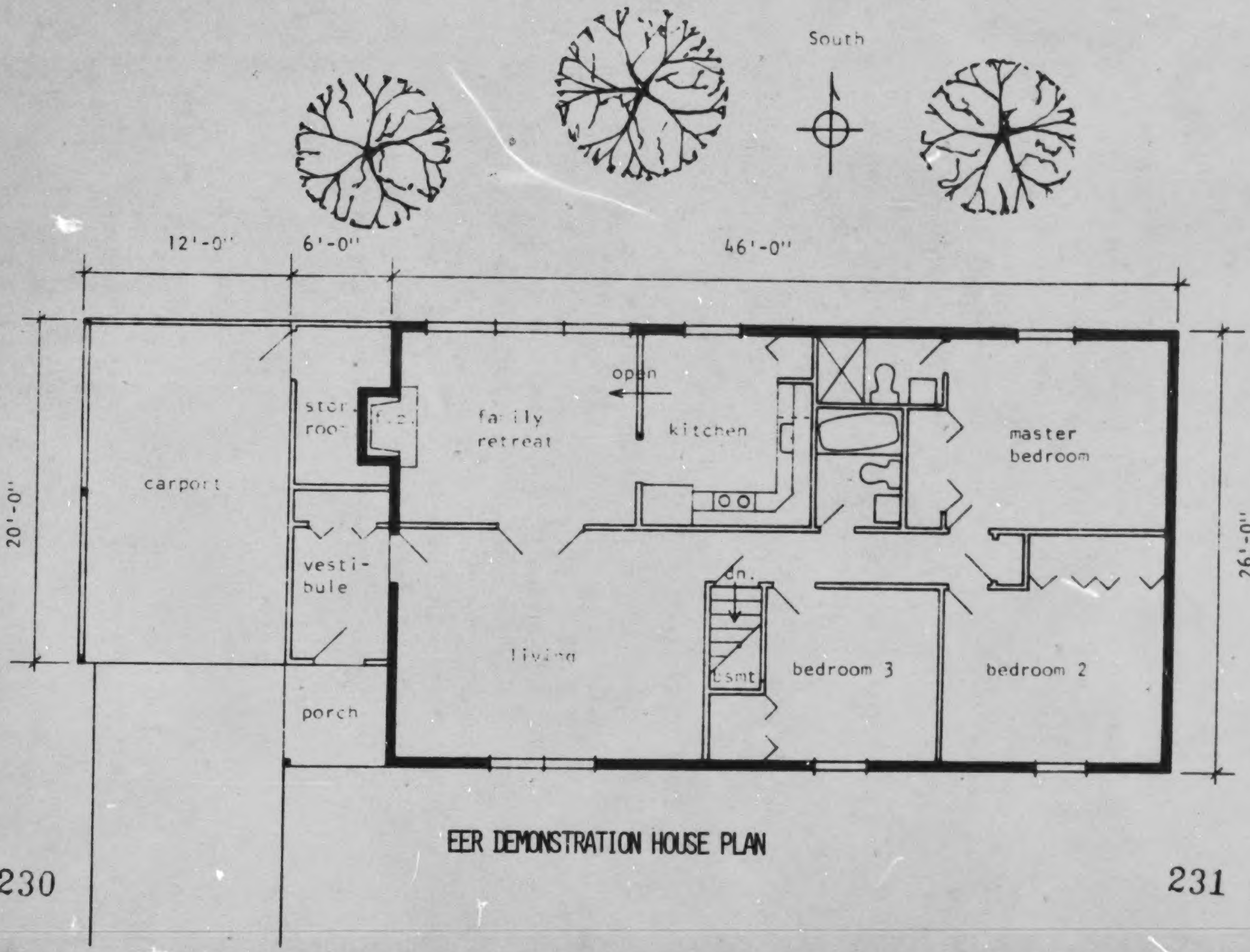
by

NAHB Research Foundation, Inc.

The Energy Efficient Residence (EER) research and demonstration program was developed by the NAHB Research Foundation, Inc. under contract to the U.S. Department of Housing and Urban Development. The purpose is to establish guidelines for cost effective design and construction of energy conserving homes.

A wide range of energy conserving options have been investigated, including house design and orientation, insulation, windows, doors, heating/cooling systems, water heating, and appliances. The most cost effective of these were selected for construction of a demonstration house. The EER demonstration house and a typical conventional house will be monitored for one year following occupancy to provide a comparison of energy use patterns. The Energy Efficient Residence is expected to use on the order of one-half the energy required in the comparison house.

Following completion of the testing program, a technical manual will be prepared with guidelines for building the most cost effective energy conserving homes under a variety of circumstances. The guidelines will address optimum levels of energy conserving features from the home purchaser's viewpoint.


South
12'-0"
6'-0"
46'-0"
20'-0"
26'-0"
stor. room
f.p.
family retreat
open
kitchen
master bedroom
carport
vestibule
living
dn.
bsmt
bedroom 3
bedroom 2
porch

EER DEMONSTRATION HOUSE PLAN

DESIGN AND PLANNING FEATURES

Compact rectangular plan minimizes heating and cooling loads

Unconditioned vestibule/storage room buffers end wall

Vestiblue "air lock" entrance isolated conditioned space

7'-6" ceiling height reduces interior conditioned volume

Family Retreat closes off for comfort conditioning

Special circulator fireplace uses outdoor combustion air

South-facing windows provide solar heating in winter

Roof overhand designed to shade South-facing windows in summer

Deciduous trees provide summer shading to South side of house

North-facing windows reduced in size to 8% of floor area

* * * * * * * * * *

EER HOUSE SPECIFICATIONS

Foundation/Floor

Dry basement construction with gravel and sump under slab

6-mil polyethylene film beneath slab and behind concrete block walls which are backfilled

Exposed walls stucco-finished to seal concrete block against infiltration

2x3-24" o.c. studs set out from wall to accommodate insulation

R-19 pressure fit insulation batts on exposed walls

R-11 pressure fit insulation batts on below-grade walls

2" thick plastic foam perimeter insulation at exposed slab edges

1" glas fiber sill sealer between foundation and sill plate

R-19 band joist insulation

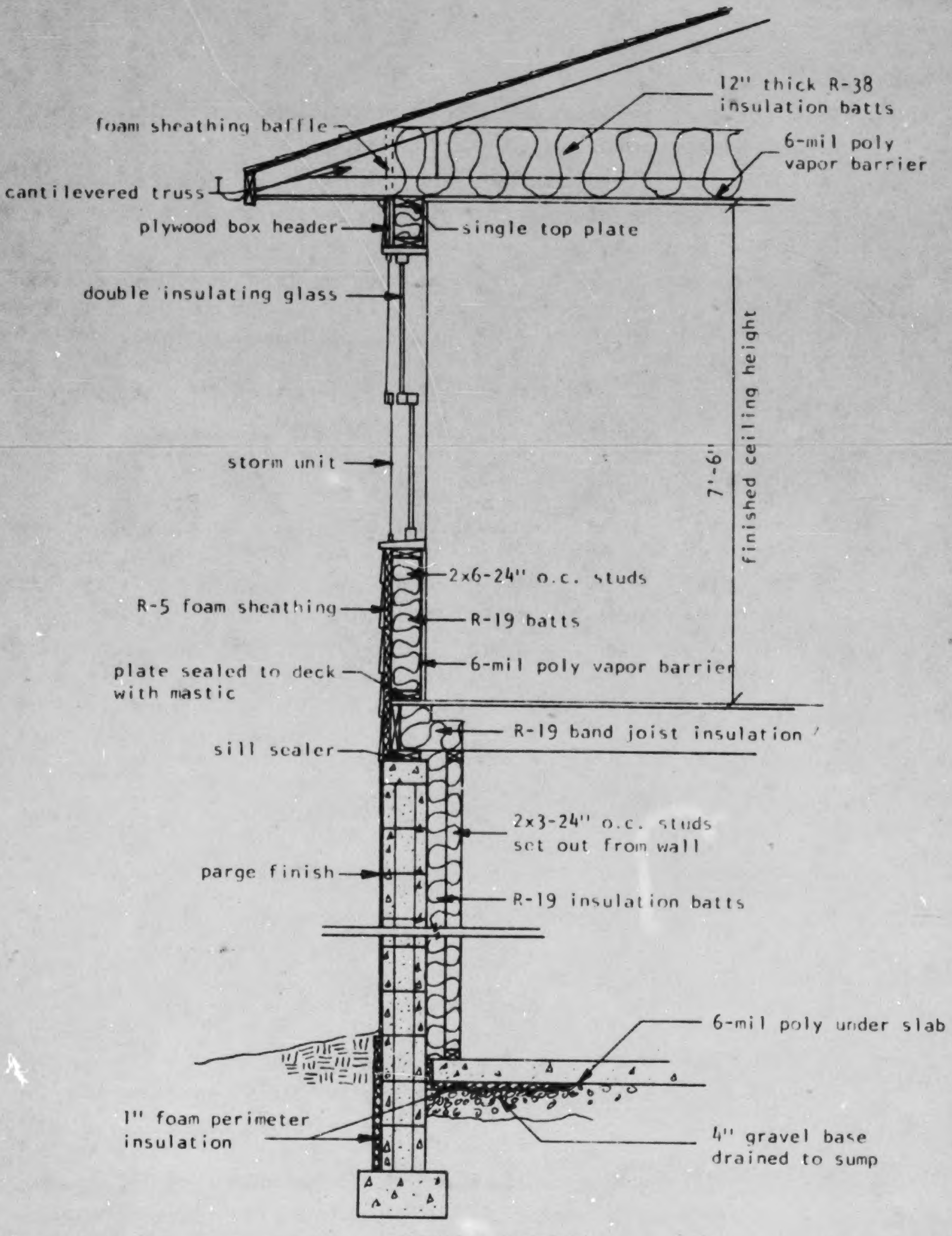
All utility entraces sealed with heavy caulk

Basement storm windows

Exterior walls

Wall height of 7'-7" (nominal 7'-6" ceiling) to reduce interior volume

2x6 stude spaced at 24" oc.c. with single top plate


12" thick R-38 insulation batts
foam sheathing baffle
6-mil poly vapor barrier
cantilevered truss
plywood box header
single top plate
double insulating glass
storm unit
7'-6"
finished ceiling height
2x6-24" o.c. studs
R-5 foam sheathing
R-19 batts
6-mil poly vapor barrier
plate sealed to deck with mastic
R-19 band joist insulation
sill sealer
2x3-24" o.c. studs set out from wall
parge finish
R-19 insulation batts
6-mil poly under slab
1" foam perimeter insulation
4" gravel base drained to sump

EER WALL SECTION

Exterior Walls (continued)

Bottom plate sealed to deck with construction adhesive

R-19 unfaced pressure fit insulation batts in walls

Continuous 6-mil polyethylene vapor barrier behind drywall

R-5 plastic foam sheathing extends up between trusses, down over band joist

Plywood box-header over openings insulated as walls

2-stud corner post with drywall backup clips to accommodate insulation at corner

Partition posts deleted and drywall clips used to accommodate insulation at partition intersections

Surface mounted electrical outlets with wiring in floor used to avoid penettating wall

Door/Windows

Insulated steel entrance door with double glazing and magnetic weatherstrip

Mechanical door closer on entrance door

Insulated, weatherstripped inner vestibule door

Interior doors permit closing off Family Retreat area for comfort conditioning

Well-weatherstripped window units with double insulating glass plus storm windows (triple glazing)

Insulating drapes used at windows to control winter heat loss and summer heat gain

Cracks around door and window frames filled with insulation and sealed with poly

Window area reduced to 8% of floor area except on properly shaded South orientation

Roof/Cealing

Standard trusses cantilevered over wall plate to provide clearance for insulation at exterior wall

12' thick R-38 pressure fit insulation batts installed from below

inuous
Continuous 6-mil polyethylene vapor barrier belwo insulation

Gable end vents provide 1 sq. ft. of ventilation for each 300 sq. ft. of cealing

24" soffit overhand provides summers shading for South-facing windows

Attic access door located in vestibule outside of conditioned area

Roof/Ceiling (Continued)

Surface mounted ceiling or wall mounted lighting fixtures to avoid penetrating ceiling

Heating/Cooling System

Simplified duct system with low inside registers and low central return

Special reduced-capacity heat pump with compressor installed indoors

Controlled bypass on inside heap pump coil for improved summer dehumidification

Heat recovery device on compressor to heat domestic water with waste heat

Manually controlled bathroom heaters for increased comfort in critical area

Heat circulator fireplace unit with glass door enclosure uses outdoor combustion air

Heat recirculator to discourage warm air stratification at ceiling in Family Retreat area

Large South-facing windows in Family Retreat area contribute solar heating in winter

Water Heating/Appliances

Heavily insulated water heater with isolated jacket set back to 120°F. temperature

Hot and cold water pipes insulated to reduce heat loss, control condensation

Low water use devices on kitchen faucet, bathroom faucets and shower heads

High efficiency refrigerator with improved insulation, energy saving feature

Electric range with heavily insulated standard oven plus microwave oven

Energy saving dishwasher uses less water and air circulation drying

Front loading clothes washer uses less water, has load size scale and selector switch

Bathroom vent fans with effective damper, exhaust through second damper in exterior wall

Fluorescent lighting four times as efficient as standard incandescent bulbs, used wherever appropriate

COMPARISON OF HEATING AND COOLING LOADS IN BTUH AT DESIGN TEMPERATURE CONDITIONS

Component	Heating		Cooling	
	Typical House	EER House	Typical House	EER House
Ceiling	3,650	1,750	3,070	1,650
Walls	4,250	2,250	4,060	2,980
Windows	8,290	5,180	6,200	4,630
Doors	4,110	1,500	2,350	260
Foundation	4,710	1,760	negl.	negl.
Duct Loss	6,560	3,590	5,450	4,410
Internal Load	-	-	3,250	3,250
Total Heating Load	31,570	16,030		
Total Cooling Load			24,380	17,180

Note: Loads for "Typical House" represent a well insulated electrically heated home which meets or exceeds current standard practice

PROJECTED ANNUAL ENERGY CONSUMPTION IN MILLIONS OF BTU'S

Energy Use	Typical House	EER House
Heating	67.2	14.5
Cooling	11.8	8.3
Hot Water	12.3	9.8
Appliances	15.2	13.0
Miscellaneous	13.5	13.0
Total Energy Use	120.0	58.6

Projected energy savings in EER house---61,400,000 Btu/year
Estimated savings on electirc bills @ 3.5¢/Kwh---$630./year

HOW MUCH ADDED COST TO THE HOME BUYER IS JUSTIFIED FOR ENERGY CONSERVING OPTIONS?

This question is best answered by determining the present value of anticipated savings in utility bills over a reasonable period of time. The present value of such future savings is primarily dependent on the rate of increase in energy costs which is assumed, and the number of years allowed to recoup the added initial cost.

Given an estimated savings in utility bills for the first year, the added investment justified for energy conseving options may be determined using the present value method. The following table shows values for the present worth of future energy savings on the EER demonstration house with the estimated savings of $630. in the first year electric bills. An annual rate of energy price increase of 10% to 12%, and an investment recapture term of 5 to 7 years are presently considered to the prudent assumptions for the near future.

Depending on the energy cost increase and recapture term assumed, the values shows in this table provide a good indication of justifiable added cost for any additional construction costs for the energy conserving options must be judged accordingly.

Additional Cost to Home Purchaser
for Energy Conserving Options
Justified by a First Year Savings
of $630. in Utility Bills

Annual Rate of increase in price of energy	Number of Years Allowed to Recapture Added Initial Cost of Energy Conserving Items			
	3	5	7	10
15%	$2,106	$3,710	$5,496	$8,560
12	1,996	3,420	4,923	7,337
10	1,925	3,238	4,575	6,627
8	1,856	3,064	4,251	5,991

THOMAS D. CALDWELL

Since 1968 Tom Caldwell has been the Director of Training and Education Department of the National Association of Home Builders, a 90,000 member Trade Association, headquartered in Washington, D.C.

He first became associated with the residential construction field in 1950 when he was appointed the Executive Vice President of the Texas Association of Home Builders at Austin, Texas. Five years later, he joined a large builder/developer in San Antonio as Assistant to the President of the company. The firm built several hundred houses per year, shopping centers, apartments and motels.

In 1960, Caldwell helped organize and became a Professor of a Course in Construction Management at Texas Christian University. In 1962 he was called to Washington to direct the activities of the Business Management Department of NAHB and has been with the Association in various capacities since that time. He is a graduate of the University of Virginia, School of Business Administration.

ATTITUDES TOWARD HOME IMPROVEMENT FINANCING FOR ENERGY CONSERVATION

Phillip Gasteyer

ABSTRACT

There has been a dramatic rise in home improvement lending by Savings and Loan Associations in recent years, a 44% annual rate of increase since 1972. Associations are now familiarizing themselves with home improvement lending in general. The financing of improvements to achieve energy conservation goals is an emerging and important aspect of this business.

The League has been, for the past weeks, primarily interested and involved with the Conference Committee for the National Energy Act, especially as it involves conservation incentives, the proposed (and rejected) financing cut-off approach, and the financing as well as installation of energy saving devices by utilities. At the same time, however, a cooperative effort by the League and the Institute of Financial Education has produced a variety of materials for inservice education and training programs. A workshop was held in Iowa in July 1977, and will be repeated in at least six other states this year.

ATTITUDES TOWARD HOME IMPROVEMENT FINANCING FOR ENERGY CONSERVATION

by

Phillip Gasteyer

The Savings and Loan business was formed to encourage thrift and "provide for the financing of homes". It is hard to imagine a more highly-regulated activity than savings and loan associations. The activities of the 2,000 or so with charters from the Federal Government are determined by an elaborate statutory scheme known as the Home Owners' Loan Act of 1933. The great majority of the remaining associations, which are state-chartered, have Federal insurance of their savings accounts -- FSLIC insurance -- and thus are governed to some degree by portions of the National Housing Act. Both the Federally-chartered and Federally-insured institutions are examined by the Federal Home Loan Bank Board, which also has responsibility for regulatory implementation of the laws just mentioned. One will also find a few hundred state or otherwise non-Federally insured institutions, such as the cooperative banks in Massachusetts, which belong to the Federal Home Loan Bank System -- so, they, too, must pay attention to Washington. And finally, the special tax treatment afforded "domestic building and loan associations" in the Internal Revenue Code imposes a universal statutory definition on our entire business. Savings and loan associations must also abide by a whole host of affiliated laws and rules -- such as those of the FHA, VA, Farmers Home Administration, Consumer Credit Protection Act, Equal Credit Opportunity Act, and so forth.

My topic, "attitudes toward home improvement financing for energy conservation" must proceed from this recitation of statutory and regulatory limitations. The question is often not whether we want to assist homeowners in retrofitting their properties, but as the savings and loan operator would ask, what will the law or rules let us do?

Given this background, I should hasten to add that we have been somewhat surprised at the U. S. League by what has happened in the marketplace; we have seen a dramatic upswing in home improvement lending activity by our institutions in recent years -- for all purposes, not just energy improvements. Our Research Department estimates that our home improvement loan portfolios will exceed $3.5 billion by the end of this year, and will have demonstrated a 44% annual rate of increase since 1972. The majority of these loans are held by larger associations, a greater percentage of which involve themselves in home improvement lending. At present, a little over two-thirds of all savings and loans in the country engage in home improvement lending.

Unfortunately, I do not have available any data which would indicate the purpose for which these loans are made -- though certainly some energy-saving improvements must be included in the totals. Even more significant to us than the dollar growth -- from less than $1 billion in 1972 to the $3.5 billion I just mentioned -- is the degree of penetration by our business of the home improvement lending market. Our figures show that savings have increased their market share from 18% five years ago to over 30% today. Since the shares of credit unions and savings banks, 9% and 5% respectively, have remained static, this penetration has occurred at the expense of commercial banks and to finance companies.

As I indicated previously, these figures came as somewhat of a surprise to us. To some degree a change in the legal ceiling from $5,000 to 10,00 in 1974 may have helped. But beyond that, one possible explanation is the availability of money, particularly in the past two and one half years. As one may know, thrift institutions tend to prosper during periods of deflation in the general economy as investors withdraw from the stock market and other media, and consumer spending proceeds cautiously. In the aftermath of the '73-'74 credit crunch our institutions experienced fast growth in the savings window but for quite a while loan demand for the traditional home mortgage remained quite slack, especially where loans on new construction were involved. Institutions were looking for new avenues, and higher-yielding avenues, to invest their savers' funds. I mention higher-yield, because savings associations are still plagued by the structural problem of borrowing short from the savings public and then lending long, for 25 or 30 years, on low yielding fixed-rate, fixed-payment, fixed-term mortgage loans. The discomfort created by this situation four times in the last decade has encouraged association managers to seek shorter investment opportunities with better returns.

I might also speculate that the rapid growth in home improvement lending reflects a demand from home-owning customers responding to the rapid housing price escalation in many parts of the country. On the one hand we would have homeowners borrowing to improve their housing in preparation for sale, thus taking advantage of their sudden increase in value by selling their vastly appreciated properties; and on the other, we might observe some existing homeowners frightened away by high prices who decide instead to fix up their present properties.

This discussion seems to me to suggest a promising future for the emerging area of financing improvements to achieve energy conservation goals. An ever increasing number of savings and loan associations are familiarizing themselves with home improvement lending in general. They are gaining valuable experience on how to service the public's demand for short-term, generally low dollar amount loans which do not resemble the familiar long-term real estate mortgage.

For our part as a trade association, the U. S. League has attempted to participate in a meaningful way in government developments. When Sen. Kennedy and others proposed their energy conservation bill in the last Congress we represented the lending community in a series of Committee hearings on both sides of the Capitol. And, of course, when President Carter invited us all to write James Schlesinger last winter, our 1977 President John Hardin of Rock Hill, South Carolina, responded by appointing a blue ribbon committee from our membership to suggest what contributions we might make to the national energy conservation effort. This resulted in a series of resolutions presented to the White House before the April address to the nation, ans we were pleased to see a number of our suggestions emerge in the Administration's National Energy Act.

I would like to characterize our involvement as one of "enlightened self interest" since, as one can understand, savings and loan associations have a tremendous stake in any residential conservation program.

We are overwhelmingly mortgage investors, and we are what is known as portfolio lenders -- meaning that we retain the mortgages for the life of the loan in most cases. I believe I am correct in saying that we now have in our portfolios over half the residential mortgage loans in America. It is our security property which is leaking heat and wasting our resources.

With energy costs stabilized, our present borrowers will be better able to meet their loan obligations. Once retrofitted, the value of our security property will be enhanced. More families will have the potential for attaining homeownership. And, as the HUD pamphlet familiar to many of you points out, we would obviously prefer to have family savings "in the bank" rather than "up the chimney".

When Congress began work on the President's energy recommendations, we were interested in three of four different aspects of the legislation. First of all, we applauded the basic approach of the White House to the residential conservation -- that is, the use of incentives, and encouraging the voluntary cooperation of private-sector institutions.

Our first concern in both the House and then later in the Senate were competing proposals from those impatient with the President's approach. I am referring to two different amendments to require that all residences must be certified as energy efficient by HUD, or some local agency following Federal standards, by 1981 or 1982 if buyers of those residences were to receive "Federal financial assistance" -- defined to include home loans by Federally-chartered and insured financial institutions, as well as Government-backed mortgages. If these amendments had prevailed, it would have been virtually impossible for most American familes to sell their homes without Government permission. While there may be merit in establishing minimum efficiency standards for new residences -- as provided by the 1976 Energy Conservation and Protection Act -- it is virtually impossible to apply such requirements to millions of existing structures. To deny financing to existing properties is to make them generally unsalable -- thus depriving existing homeowners of their most fundamental property rights.

We were pleased when the Ad Hoc Energy Committee on the House side and the Commerce Committees on both the House and the Senate sides rejected the financing cut-off approach to residential energy conservation.

Another of our concerns was the provision in the President's original bill directing public utility companies to assess the thermal efficiency of homes, sell the materials, install the devices, and finally provide the financing for utility users through increases in monthly bills. While we would agree that utilities are well-equipped to measure energy waste and perhaps perform an accreditation of materials and contractors for installation, they are not particularly familiar with, and in some cases exempt from, the extensive legal requirements which apply to lending institutions -- such as truth-in-lending, fair credit reporting, fair credit billing and the Equal Credit Opportunity Act. I might also mention another recent, and troublesome area, the FTC's trade regulation promulgated last year altering "the holder-in-due course doctrine". This FTC regulation exposes lenders to the seller of a product if there is a referral arrangement between the seller and the financial institution. If, as the FTC has proposed, this "Seller's Rule" is broadened further, improvement lending could be substantially impaired.

We believe that it is in the public interest for financial institutions to provide financing and utility companies to provide utilities. It has been quite difficult in the past few days to determine exactly what the Conference Committee from the House and the Senate has decided to do in this area . . . though I believe our position has been largely accommodated. While this may not jive with some newspaper reports you have read, it is my understanding that the bill as it will emerge from the Conference Committee prohibits utilities from financing energy improvement in excess of $300 to any single customer. Improvements previously begun above that ceiling will be "grandfathered", and the $300 limit will also be waived if a utility can demonstrate that it has extensively advertised a program, or state laws already require such extensions of credit by the utility, or the State Governor asks for a special exception. Finally, utilities would be barred from engaging in the installation of energy-conserving devices unless, of course, such activities fall within similar waiver provisions.

In another area, we suggested to the President, and I believe it is retained in both the House and Senate versions of the National Energy Act, and expansion of authority for two existing secondary market facilities -- Federal National Mortgage Association and the Federal Home Loan Mortgage Corporation -- to permit purchase of energy saving home improvement loans. This is basically a standby authorization. The secondary markets, as you know, provide a mechanism for moving funds from capital-surplus to capital-short areas in the economy. Lenders doing home loan business with FNMA or FHLMC typically originate a block of loans which the agency then buys -- making new funds available to the originator. The secondary market facility then holds the loans for its own porfolio or repackages them (or interests in them) for reselling to other institutions with excess funds in the mortgage field. Then the repackaged instruments can be designed to appeal to other financial institutions, or even to new kinds of investors -- pension funds -- thus tapping new sources of capital. The same mechanism, we believe, can be applied to energy-saving home improvement loans.

While our secondary markets' suggestion may not be a major component of the President's financing approach at the present time, it will reassure financial institutions interested in offering home improvement loans for retrofitting.

In the course of the year, we also expressed our support for residential conservation proposals in two other areas. For families of substantial means, those who pay substantial tax bills and do not need to borrow to accomplish energy-saving improvements, we supported the system of tax incentives for home insulation and for solar, wind and geothermal devices. If I read the papers correctly, everyone seems to agree that these tax credits will survive the boisterous debate over other tax portions of the House and Senate bills. At the other end of the income specturm, we recognize that families which are "unbankable" or are only marginally eligible for loans -- and, because of their low income, do not pay enough Federal tax to make credits a meaningful incentive. This is the "weatherization grant" portion of the President's package, originally authorized in the 1976 Act, and accelerated and expanded in this year's legislation. The Conference Committee, I believe, has authorized funding for grants up to $800 million and also authorized $3 billion in loan guarantees for homeowners with incomes below area medians, with another $2 billion in guarantees for unsubsidized loans in credit-short areas.

I personally, and the League, have been preoccupied with the progress of the national legislation, but I would be remiss if I did not discuss very briefly some developments in the states. I have not attempted to prepare any comprehensive report on the 50 jurisdictions, but I would like to bring to the reader's attention a rather interesting program in the State of Oregon. Under three laws signed recently by the Governor, utilities and savings and loans are cooperating in an innovative program to upgrade residences. Under one bill, individuals who pay cash for weatherization materials and labor may take a tax credit of 25% (up to $125) on their Oregon income tax. Alternatively, there are two loan plans available which differ depending on whether the homeowner is a customer of an investor-owned utility, or is a customer of a public-owned electric utility or oil heat dealer. The bill involving investor-owned utilities is illustrative: the homeowner gets a 6-1/2 percent loan, though the lender receives a higher yield because of a tax credit against the institution's Oregon corporate excise tax liability. The utility company serves as the "general contractor" where costs do not exceed $1500 (unless storm windows are involved, in which case a higher amount is permitted). The utility guarantees the quality of work to the homeowner and further, guarantees repayment of the principal on the loan to the lender. From the point of view of the savings and loan associations, the arrangement has still further appeal as the utility handles most of the paperwork.

PHILLIP GASTEYER

Phillip Gasteyer is Associate Director of Washington Operations of the U.S. League of Savings Associations. The U.S. League is the principal trade organization of the savings and loan business and represents 4,500 savings and loan associations -- with members in every state and territory in the country. The League is a "full service" trade association, and includes a major subsidiary, the Institute of Financial Education, to provide in-service training programs to employees in the savings and loan business.

Phillip is involved with another aspect of the League's effort; its governmental affairs program here in Washington. He is an attorney, a registered lobbyst, and a member of the District of Columbia Bar. He is primarily responsible for Congressional testimony and much of the savings and loan business to various agencies of Government.

A native of Beverly Shores, Indiana, Mr. Gasteyer is a graduate of the University of Chicago, and has a law degree from Catholic University in Washington, D.C. Prior to joining the League seven years ago, he worked as a Congressional Aide and business and financial writer.

A REPORT
On
COMBINED ENERGY CONSERVATION EDUCATIONAL PROGRAMS OF THE UNITED STATES LEAGUE OF SAVINGS ASSOCIATIONS AND THE INSTITUTE OF FINANCIAL EDUCATION

Gail Rafter

A REPORT
ON
COMBINED ENERGY CONSERVATION EDUCATIONAL PROGRAMS OF THE UNITED STATES LEAGUE OF SAVINGS ASSOCIATIONS AND THE INSTITUTE OF FINANCIAL EDUCATION

by

Gail Rafter

The United States Leauge of Savings Associations and The Institute of Financial Education have joined forces to develop education and training programs in energy conservation for savings and loan managing officers, loan officers and appraisers. The combined efforts of the U. S. League and the Institute have resulted in several new publications, an "Energy Efficient Housing Workshop" and a mini-course entitled "Energy Conservation and the Lender" that will be introduced in January 1978.

In July of this year, the Institute conducted the first "Energy Efficient Housing Workshop" in cooperation with the Iowa Savings and Loan League. A sheet summarizing the content of the Workshop is inclued in your materials. Over the next two months, the Workshop will be conducted in Oklahoma, Florida, Mississippi, Tennessee, Oregon and Illinois through state savings and loan leagues. Copies of the Workshop notebook are available through the Institute.

In July, the U. S. League sponsored its first national Energy Conservation Seminar in Denver. Based on this Seminar, as well as recommendations by the U. S. League's Energy Committee, as Energy Conservation Supplement to be included with eight Institute courses was developed. This supplement includes an energy glossary, outside information resources, conservation strategies, guidelines to be used to evaluate the energy efficiency of new homes, and a "how-to" segment on fixing up old homes, avoiding dishonest contractors and achieving recommended R-values.

The primary purpose of the supplement is to encourage the discussion of energy conservation in those courses not directly related to the topic. For example, including this supplement in the Residential Appraising and Real Estate Principles courses, encourages both instructors and students to examine the far-reaching impact of the energy problem on every facet of their personal and professional lives.

An Energy Clipbook has been developed by Harold Olin, Director of the U. S. League's Architectrual and Construction Research Department. This Clipbook includes discussions on energy and the lender, saving energy by design, building and selling energy-saving homes, the economics of energy conservation, and solar energy.

In addition to the Clipbook, Harold has also completed a housing energy primer entitled Energy Conservation and You. The primer focuses on fundamentals of energy and energy conservation; planning, designing and building for energy conservation; and, solar energy: its promise for tomorrow. The primer is currently in production and will be available the first of the year through the U. S. League.

The Institute has developed a six-week mini-course called "Energy Conservation and the Lender" that will be introduced in January. The course uses the Energy Clipbook and the Energy Primer as its basic text materials, and includes an instructor's manual and a student supplement. This course should enable students to: recognize and articulate the lender's role in dealing with the nation's energy crisis; identify and asses important features of energy efficient residential construction; evaluate the various forms of insulation and the energy saving design options on the market; explain the basics of energy conservation to customers; and, develop loan and appraisal procedures to encourage energy efficient residential construction.

The U. S. League also has a slide/cassette program available--"Energy Saving Homes for Profit and Comfort" --that looks at the long-range energy picture and the opportunities for increased comfort and savings through home improvements.

My remarks provide a quick overview of what we (U.S. League and Institute) have available in the area of home energy conservation. I would like to conclude my remarks by citing the following statement by the U. S. League's Energy Committee:

> "We are concerned that the shortage and high cost of energy may curtail the production of new housing and make home ownership too burdensome for many Americans.
>
> "We hope that the savings and loan business, which historically has provided three out of five home loans in America, can play an important role in reducing residential energy consumption and easing the burden of home ownership for the American people."

ENERGY CONSERVATION EDUCATIONAL MATERIALS AVAILABLE THROUGH THE UNITED STATES LEAGUE OF SAVINGS EDUCATION

EDUCATIONAL MATERIAL	U. S. LEAGUE OR INSTITUTE	PRICE
Energy Clipbook	U.S. League	$5.00
Energy Primer	U.S. League	Price not yet available
Energy Efficient	Institute	$25.00
Energy Conservation Supplement	Institure	No charge 10 copies of less
Energy Conservation and The Lender	Institute	Price not yet available
Energy Slide Show	U.S. League	$60/purchase $20/rental

ENERGY EFFICIENT HOUSING WORKSHOP
OFFERED BY THE INSTITUTE OF FINANCIAL EDUCATION
AVAILABEL THROUGH INSTITUTE CHAPTERS AND/OR STATE LEAGUES

A one-day workshop with lectures, slide presentations, case studies and pre- and post-tests.

Objective

To train loan officers and appriasers in the basics of energy efficiency including heat and moisture control, human comfort, structural ventilation., and insulation.

Presented By

Staff members of The Institute or U.S. League and technical representatives of Owens-Corning Fiberglas Corporation.

Content

The workshop includes technical presentations on understanding comfort and thermal performance in both new construction and existing housing. Material is presented by two or three experts familiar with local conditions. Lectures are illustrated using slides of actual field conditions. Case study exercises are included to involve the class in simulated evaluations of housing.

Handout Material

Each participant will receive a notebook of basic information, including recommended levels of insulation, recommended installation techniques, and check lists to use to evaluate the energy efficiency of construction.

Approximate Cost

See attached sheet.

Track Record

The program has been presented with the cooperation of the Iowa Savings and Loan League. For a candid appraisal of the meeting, contact the Iowa Savings and Loan Leagues, Des Moines, Phone: (515) Cashman, 282-8168. Ask for either Dennis Montgomery, President or Kathy Cashman, Executive Assistant.

To Schedule The Program

If you are interested in having the program conducted in your community, contact your local Institute Chapter President, nearest State League Office, or call The Institute of Financial Education at (312) 644-3100 and ask for either John Schmidt, Vice President, or Gail Rafter, Coordinator of Chapter Services.

GAIL G. RAFTER

Gail Rafter is Chapter Services Coordinator for the Institute of Financial Education. In this position she is involved in the planning and execution of pilot programs and workshops in Institute chapters, conducts Instructor Training Seminars, and coordinates all chapter activities with the National Office.

For three years prior to assuming her current position, Ms. Rafter was a member of The Institute's Research and Development Department. During that time, she was responsible for the development of course materials for Real Estate Principles; Real Estate Law; Commercial Law; Housing: Design; Housing: Construction; Challenges in Urban Lending; and, Political Action.

Before joining The Insitute in 1972, she worked for DePaul University in Chicago, and West Virginia University in Morgantown, West Virginia.

SOME OBSERVATIONS ON THE ENERGY CONSERVATION EDUCATION

Andrew H. Sansom

ABSTRACT

Ambiguity and some confusion exist in energy conservation education. The Energy Institute, funded by and located at the University of Houston (Texas) has collected programs and materials designed for energy education in schools. Most appear to be incomplete in one or more of the curriculum aspects generally accepted as making for an effective curriculum. There are a number of basic decisions which need to be addressed in energy curriculum education: The role of the schools in relation to the "hidden curriculum" experienced outside the classroom; formulation of a national energy ethic; the role of the government, the role of the teacher as curriculum facilitator in schools.

SOME OBSERVATIONS ON CONSERVATION EDUCATION

By

Andrew H. Sansom

The status of energy education to me is the same as the status of our national energy policy, and the lack of such a policy is the greatest impediment to real learning in energy.

President Carter asks us to save gasoline, and the filling stations are giving away cokes again--we waited in line to buy gasoline three years ago and oil company profits skyrocketed.

We are expected to develop an energy education system against a wasteland of public mistrust and disrespect. We are trying to reach children in home in which parents have lost all respect for public institutions. And I might add, this situation is getting worse, not better.

To further exasperate this difficult state of affairs, we face the pervasive effects of a hidden curriculum . . . a curriculum which forms the educational base for all of our people, children especially, and which has nothing to do with the classroom, the teacher, or any other component of formalized education in America. State simply, the behavior of Mom and Dad and Charlie's Angles have far greater impact than anything we have come up with so far.

On any given evening devoted to what we euphemistically refer to in this country as "Home Entertainment", our children are bombarded by what seems to be a continuous high speed chase which begins after the evening news and doesn't reach its climax until Johnny Carson comes out for the monologue. This automotive spectacle is always conducted in the biggest, fastest, loudest machines Detroit has to offer and it looks like so much fun.

Switching channels, what is the child to infer when he or she watches the most valuable player or world series hero presented with the keys to a shining new luxury car with thousands of fans roaring in the background.

The effect of television is probably minimal compared to parental behavior, but its effect is profound nevertheless. Every time an American citizen hears "energy For a Strong America" he or she is lulled and cajoled into believing that some big institution such as the government or a multinational corporation is going to pull this one out of the fire given a little breathing room. The fact is . . . when these fuels, including coal, are burned, they are gone . . . that is all there is.

But rather than live up to that stark inevitability, we are buying nearly half of the oil we use abroad, where there is plenty for now. That is why the filling stations are giving out glasses again. That is why we do not wait in line. But that oil will cost America forty-five billion dollars this year. Forty-five billion dollars withdrawn from America's great savings account. Enough to pay the salaries for seven and a half million jobs. Enough to build nine hundred thousand new homes; "Energy For a Strong America".

Until we confront this head-on, we need not bother with Energy Conservation Education.

Another phenomena is what might be called a non-existent curriculum. We really have not yet, in any state, or at the Federal level, faced the fact that there really is no curriculum, as such, in energy. Maybe that is as it should be.

There are too many extra-curricular demands placed on the teacher already by various governments already. In Texas, where I live, teachers must cerfity that they spend a mandatory number of hours every week teaching: Drug abuse, and the free enterprise system. Shall we force them to take on another?

For at least a decade, energy education will probably be dependent on the development and utilization of supplementary materials. Despite widespread recognition of the need for energy education materials by both educator and publishers, the public school curriculum is already overloaded and schools are being pressured to stress basic skills. Another contributing factor is the practice of only developing basic textbooks for required core subjects. Finally, since no government agency has a clear directive to develop curriculum in energy education, it appears that a large-scale energy education curriculum has little chance of being developed and implemented in the near future. And there is ample evidence that policy makers here do not believe it is important.

When Energy Research and Development Administration (ERDA), with a budget of some 7 billion dollars, established its education office, it staffed the unit with one man and gave one hundred thousand dollars. Federal Energy Administration (FEA) abolished its education program and Department of Energy (DOE) is, at this point, every man for himself.

Finally, to the extent that we've dealt with energy education at all, we've reinforced what is clearly a non-integrated curriculum. In the materials that do exist, there is an acute shortage of effective, unbaised instructional materials. Primary level materials and activities that stress economic, political and global aspects of the energy dilemma are rare. The bulk of the well-written materials that do exist are in the science and technology area. So while interesting materials on how to read an electric meter, the generation and transmission of electricity, how petroleum is refined and other technical matters are available, instructional materials that treat the majro energy policy issues of deregulation, nuclear proliferation, increasing trade deficits, and regionalism are almost non-existent.

If the classroom teacher seeks teaching aids from the government today, he or she would likely be sent guides to technical films and books like "The Beagle as an Experimental Dog."

Where does it say that you can not drive an automobile with nuclear power? Where does it say that the West Germans and the Japanese use a thrid of the energy we do with the same standard of living? Where does it say that our standard of living isn't by definition a function of wasteful energy consumption? Where does it say that there may not be enough money in this country to build all the powerplants it will require to keep up this pace?

We have just completed, at the Energy Institute, a comprehensive survey of the pre-college energy education at the State level under the direction of Dr. John Steinbrink and Dr. Robert Jones. I will present here the major summarized findings of this study.

Many of the State programs were not truly curriculum materials because in the great majority of cases they lacked stated or implied curricular organization. They simply gave outline objectives and the development of most instructional activities and their sequencing was left to the classroom teacher. Many programs did suggest sample activities to meet the stated objectives, but the overriding implication exists that the actual curriculum should be developed by local personnel well-versed in the local energy situation. Consequently, most of the guides are primarily outlines that leave much to be developed by the teacher/user.

Inquiry as a teaching/learning mode is prominent in several programs and the majority employ some student-centered activities. Many programs deal with higher level cognitive outcomes and some suggest simulation and role playing activities; however, few include sufficient real data or background information to make these activities meaningful. In relation to background and resource materials, there are extensive bibliographies, film lists, and technical readings, but with one exception, there are no audio-visual materials or other media actually furnished. Finally, a surprisingly large number of programs include only technical readings, and the readings that are provided are principally directed toward the teacher rather than the student.

In the area of teacher instructions, almost all of the programs leave a great deal of research and development up to the actual user. The teacher is expected to research and provide factual details. To make this situation more difficult, there are only minimal instructions for introducing, implementing, and conducting the lessons, and little teacher support in general. Data bases dealing with the science and technology of energy production and utilization, and the social issues and government regulations involved, are insufficient. When data are presented, they are primarily teacher-directed and there is little direction as to how to present the complex and often conflicting information to students.

It appears that most of the curriculum efforts are beginning from a conceptual viewpoint; in fact, the conceptual organization of several programs is quite well thought out. The organization maintains a strong science and technology orientation, but only a few programs deal equally well with both science and social studies concepts. In no case, however, was the curriculum guide presented as a totally unorganized set of independent or unrelated activities.

In assessing the pedagogical strengths and weaknesses of the curriculum materials, an attempt was made to determine the appropriateness of the units in terms of learner developmental levels, the consideration of learnning outcomes in both cognitive and effective domains, and the levels of outcome within these domains. In most cases, grade-levels were indicated, and the majority of the materials were judged to be appropriate to the stated level or range of levels. Several programs specifically stated that learner developmental levels in the design of activities had been considered. Most of the programs introduce the concept of The Energy Ethic or the need for developing one. In many, a definite awareness is shown taht personal values are crucial in energy conservation. There are few activities, however, that provide for inquiring into the ethic that has governed the development of our energy consumptive society. In the small number of programs where valuing activities are included, decisions are demanded without either sufficient personal involvement or an appropriate length of time to form internalizations and complex value or orientations.

The materials tend to call for an instant reorientation. Thus, while there is an awareness of the need for rethinking and restructuring of values, little that is useful is provided for in the suggested activities.

As mentioned previously, taken as a whole, the programs offer many activities and inquiries to foster cognitive growth. Generally these involve some higher level process skills but are limited to scientific and technological content. There are opportunities for higher level investigations and utilization of critical thinking skills; however, many programs are dominated by convergent, lower-level recall and comprehension tasks. Very few individual programs deal consistently at the decision-making, problem-solving level.

The contnet was evaluated in terms of technical or scientific concept orientation and relevance to contemporary social issues. Most of the programs tend toward the treatment of technical issues (energy sources, conversion, transmission, environmental impact and alternative energy sources) as opposed to social and government policy issues. Most of the programs make strong pleas for the reorientation of values to include personal energy conservation practices. There are varying levels of technical sophistication in the presentation of the materials ranging from oversimplification to inundation with complex presentations of multiple and range graphs and alternate scenarios for the future. As stated previously, most of the programs tend toward transmitting an oversimplified data base with no real guidelines for interpretation. Policy and social issues are superficially treated in many cases and in only two programs were social issues given a priority over science and technology as a basis for study.

So where do we go from here? Here being the Nation's Capitol. First, to the extent that a new adminsitration offers the promise of a fresh start, the problem must be attacked on a interagency basis. DOE will have the money . . . But education is not its primary job. Further, the education people in this new behemoth will never be able to escape the smothering effects of technocratic clearances and the kind of institutional constipation we've seen from the agency already.

Second, we need to re-program some funds as quickly as possible. The lack of materials or even guides to good materials is astonishing and the need is immediate, not by 1979 or 80 or wherever the budget cycle happens to be at the moment.

Third, we need to get the heavies involved. We're fooling ourselves if we believe that we can get at any of these root problems without some support. We need some clout and some interest above the division chief level at DOE.

Finally, what the government really must do beyond providing the resources . . . is get out of the way.

The adminsitration and the Department of Energy cannot use education programs to prove to any or all special interest groups that their interests really are protected.

The government must never confuse energy education with agency public relations. DOE propaganda is just as destructive as oil company advertising if it is typically designed to show how much your government is doing to keep you just as warm and comfy as you have always been. This tradi-

tional government approach confuses the issues of individual versus institutional responses to energy problems and further says to the man-on-the-street . . . "just keep your faith in us and we will solve this problem for your." Well . . . folks, it just ain't so.
The politicians, including the President must refrain from telling Americnas that they should be getting their energy cheaper . . . and to the extent that they are not, they are being ripped off. In my judgement this is irresponsible in a country where oil is considered expensive at $12.00 per barrel while an equal volume of coca-cola is priced at $120.00.

Honesty--even if it is painful, must be the cornerstone and baseline of energy education in America. We are deluding ourselves and warping the perspectives of our children who will cook their meals on the last gas stoves and drive to work in the last motor cars and remember us as the ones who threw it all away for the last barrel of oil.

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